BOMBAY GOVERNMENT RECORDS.

No. XLVI.—New Series.

ANNUAL PROGRESS REPORTS

OF THE

EXECUTIVE ENGINEERS IN THE SOUTHERN, CENTRAL, AND NORTHERN PROVINCES

OF THE

BOMBAY PRESIDENCY, IN 1856-57.

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1856-57.

Bombay:
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MEMORANDUM.

On the 22nd November 1855 the Government of Bombay passed a Resolution (No. 1806 of 1855), from which the following is an extract:—

"The Governor in Council desires that each Executive Engineer, or other Officer acting directly under the Superintending Engineer of each Province, should submit to the Superintending Engineer, at the close of each year, a concise Report, showing what has been done by him and each of his subordinates, in what respect each work executed has failed or been successful, what remains to be done in the District, and what agency is available or desirable for carrying on works in it. These Reports, each of which should, if possible, be accompanied by a Sketch Map of the District to which it relates, should be forwarded with his opinion, and any necessary propositions, by the Superintending Engineer, to the Chief Engineer of Public Works, who should submit them to Government with any remarks which he may deem necessary.

"Government would point to the very interesting Reports contained in No. XV. of Selections from the Records of the Madras Government, as containing useful suggestions for the preparation of those which they are desirous of obtaining; they will not supersede, but rather illustrate the General Annual Progress Report which is now prepared. A copy of the Number of the Madras Selections referred to, should be furnished by the Chief Engineer of Public Works to each Executive Officer in the Department."

2. These instructions were not acted upon in the year 1855-56, and the Reports now printed are the first which have been submitted to

Government in conformity with them. They are arranged in the following Compilation, not in the order in which they have been written, or laid before Government by the Chief Engineer, but according to the geographical situation of each Executive Charge, commencing from the Southward.

3. The late disturbances in Rajpootana, and the intention of the Government of India (now placed in abeyance) to transfer the Nusseerabad and Neemuch Charge to the jurisdiction of the Superintending Engineer of the Saugor and Nurbudda Circle, have prevented a Report of operations in Rajpootana from being submitted, or required by Government. And no Reports have, as yet, been received from the Executive Officers in Sind.*

4. The Reports now printed will be found arranged in the following order, each followed by the Memoranda or letters of the Superintending and Chief Engineer with which it has been laid before Government:—

1.	Dharwar	Southern Circle.
2.	Belgaum	
3.	Rutnagherry	
4.	Kolapoor	
5.	Sholapoor	
6.	Sattara	
7.	Poona Collectorate	Central Circle.
8.	Poona and Kirkee Cantonments	
9.	Tanna	
10.	Nassik	
11.	Ahmednuggur	
12.	Candeish	
13.	Surat and Broach	Northern Circle.
14.	Ahmedabad and Kaira	
15.	Deesa	

5. A copy of the Minute of Government reviewing the whole, is printed at the end of the Compilation.

* The Reports from Sind have since been received, and will form the subject of another Resolution.

ANNUAL PROGRESS REPORTS

OF THE

EXECUTIVE ENGINEERS,

BOMBAY PRESIDENCY.

DHARWAR.

No. 375 OF 1857.

PUBLIC WORKS DEPARTMENT.

To Lieutenant Colonel KILNER,

Superintending Engineer, Southern Province.

SIR,—In forwarding you the accompanying annual report, I trust it may be borne in mind that I have only been in charge in this Collectorate about six months, and therefore I fear that the remarks I have to offer on the report will fail in interest by the brief experience I have had of the Collectorate.

2. The chief feature of the works in this Collectorate which would attract attention, is the heavy expenditure for "Repairs," compared with that for "New Works." The large number of tanks that have been repaired during the past official year will account for this. Very few new works of any importance have been carried out. It is true that special sanction was received for the commencement of three new first class roads, but the sanction only arrived in April, and therefore little was done to them before the end of that month.

3. One important work, begun during the last official year and just completed, is a bridge at Hooblee, consisting of three arches, each twenty feet in span, and elliptical in shape. The bridge was designed by Lieutenant Playfair, of the Engineers, and completed by myself, under the able supervision of Serjeant Overseer Mungavin. The construction has proved entirely successful. It was paid for by the Municipal authorities and private subscription, and cost about four thousand four hundred and eighty (4,480) Rupees.

4. The second class road from Dharwar to Lingunmuth has been opened out and nearly completed. The distance is twenty miles. The expenditure is, I am of opinion, small in comparison with the amount of work done, but then much assistance has been rendered by convict labour. The work has been ably performed by Serjeant Assistant Overseer Fawcett. The second class road from Dharwar to Behuttee, to a distance of twelve miles, has been opened out and nearly completed by Serjeant Assistant Overseer Coulter, who has done this well.

5. The road from Maharajpet to join the Compta trunk line at Pala, a second class road, has been executed by Assistant Surveyor and Builder Hurree Dadajee, as far as a village called Kumbusee Kope, a distance of five miles. It has been well done; but it is a matter of regret that from Kumbusee Kope to Pala, a distance of about three miles, nothing has been done. This latter portion is beyond the Bombay frontier.

6. From Summusghee to Kode the road has been opened out, a distance of thirty miles. A portion of it, about four miles long, only lately came into the hands of this Department. There is nothing particular to remark upon it but that it is a tolerably good road, but in parts runs over a rotten kind of soil, for which it would be advantageous to estimate for a special expenditure.

7. There are no other new works in the Collectorate on which I have any particular remarks to offer.

8. The improving the approaches to the Ferries in the Collectorate, sanctioned for Rs. 302 (of which only Rs. 146½ have been expended), has been delayed by the non-arrival of the wire rope. (It arrived this day, 3rd June 1857). Both Lieutenant Playfair (when here) and myself wrote about it several times, but no answer was vouchsafed by Messrs. Horton and Co., Calcutta, till lately.

9. I now have to treat on the subject of Repairs. Those effected to roads and buildings are comparatively insignificant to those effected to tanks, and it is with regard to the latter only that I shall refer.

10. "Repairs" and improvements are hardly fair terms to be applied to several of the tanks in the Collectorate that have during the past year been re-called into existence, if I may be pardoned the expression.

11. In many, if not most cases, "Tank Repairs" should, in my humble opinion, be classed under the head of "New Works," from the fact that the repairs are generally of so extensive a nature.

12. The most important of the tanks that have been, I may say, resuscitated during the past years, are those at the villages of Behuttee, Hebsoor, Satunhullee, Hurreelingudhullee, and Koosoogul. Other large ones have lately been commenced.

13. Generally speaking, the Ryots and others interested in these tanks have rendered more or less assistance. In one isolated case, at Hebsoor, the Native authorities were fined for their apathy and sloth in helping us; but generally I cannot complain on this head.

14. The Ryots are peculiar in one respect, and that is, they almost invariably petition for work to their tanks to be carried on differently to the sanctioned plans and estimates, though every facility is afforded them, at the time of making the estimate and plan, for expressing their wishes on the subject. This is a difficulty, however, which is generally easily removed.

15. One other point that I must notice is, that occasionally, when a work is sanctioned on condition that the Ryots or others pay up the subscriptions they have promised, they refuse to pay, and the work is suspended, if not altogether set aside. Thus the trouble and labour of preparing plans and estimates have all been thrown away. The only remedy for this, that I can see, is for the Collector to procure such security from the Natives as to guarantee no loss to Government by the preparation of plans and estimates in any case.

16. I may perhaps be excused here for remarking, that excepting as regards tanks for irrigation, it should be always well ascertained by the Collector and his Assistants whether the inhabitants of the different towns and villages in the Collectorate, when praying for Government to pay a whole or a portion of the expense that may be

incurred for repairing wells and tanks for their drinking water, are unable to defray the expense themselves, as it is proverbial that this Collectorate is especially wealthy. I only offer this as a suggestion.

17. I have already reported on the subject of the new system of Maramut Maistrees lately introduced into this Collectorate, and will only further add, that I believe it fully answers the purpose for which it is intended.

18. With these rather scattered remarks I have only now to subjoin a brief report of the different European subordinates employed in the Dharwar Collectorate during the past year.

19. Mr. Pemberton, Sub-Assistant Executive Engineer, during last monsoon completed the plans and estimates for a first class road from Summusghee to Hurrulhullee on the Tumboodra River. During the month of November last he was in temporary charge as Acting Executive Engineer. Soon after my arrival he went out to a place called Harrogerry, to survey a site for a bund for irrigation at a nullah near the village. On his report to me that, though the bund could be built, yet that the nature of the ground on either side was such that the water could not be carried from the bund for irrigational purposes, I went there myself, and, after careful examination, was satisfied that his opinion was correct. He then proceeded to Balumbede, on the Wurda River, for a similar purpose; but I regret to say that this scheme likewise failed, and on visiting the ground with Mr. Pemberton, I was convinced of its impracticability. Besides these surveys, Mr. Pemberton has been employed latterly in the preparation of plans for bridges for the proposed first class line of road between Bunkapoor and Hurryhur. He has had the supervision of the construction of the second class roads between Dharwar and Lingunmuth and Dharwar and Behuttee, and the repairs of several tanks. He has also rendered me assistance in the office, and has at all times entered upon the duties allotted to him with alacrity, whatever they were. He draws very nicely and surveys correctly.

20. Serjeant Mungavin, in addition to assisting in the office, has had the charge of erecting a bridge with three arches at Hooblee, in

this Collectorate. It is just finished, and the workmanship does him much credit. It consists of three elliptical arches, each twenty feet in span, and connects the towns of New and Old Hooblee. He has also had charge of the annual repairs to a portion of the made line of road to Compta passing through the Dharwar Collectorate; the construction of a piece of road near Misreekote; improving the portion of road in this Collectorate between Hooblee and Sholapoor; constructing a portion of the lately sanctioned first class road between Hooblee and Lungateerkope; and repairs to various tanks. Of the latter, the Behuttee Tank improvements, both in point of execution and progress, do Serjeant Mungavin much credit. Serjeant Mungavin has given me every satisfaction in the execution of his duties.

21. Serjeant Fawcett has had the charge of constructing about twenty miles of second class road between Dharwar and Lingunmuth on the Madras frontier. This work is just completed, and does the Serjeant great credit. He has been also in charge of the annual repairs to the road between Dharwar and Kulkuljee, twenty miles, and that portion of the trunk line from Belgaum to Compta which lies between the Belgaum limit at Kittoor and Byderkope, twenty-four miles, and repairs, &c. to thirty-eight miles of the Sholapoor line which lies in the Dharwar limit. In addition to the above, he has been employed in the office work at head quarters. He has given me every satisfaction in the way he has conducted his duties, and is a thoroughly zealous, active, practical man.

22. Serjeant Coulter has been in charge of the works at head quarters, none of which are of any great importance. He has likewise superintended the construction of twelve miles of second class road between Dharwar and Behuttee; also the repairs to a tank at Sool, one at Shevullee, and one at Hebsoor. This last is a very large work, and, notwithstanding many difficulties the Serjeant has had to encounter in procuring work-people, it has advanced rapidly, and does him much credit. He has also assisted in the office. Serjeant Coulter has given me every satisfaction, and is a zealous and active man.

23. A rough tracing of the Collectorate is herewith forwarded.

I have the honour to be,
Sir,
Your most obedient Servant,
G. CLOSE, Lieutenant,
Acting Executive Engineer, Dharwar Collectorate.

Executive Engineer's Office, Dharwar Collectorate,
Dharwar, 5th June 1857.

No. 4180 of 1857.

PUBLIC WORKS DEPARTMENT.

Office of the Chief Engineer of Public Works,
Bombay, 10th August 1857.

To the Right Honorable LORD ELPHINSTONE, G.C.H.,
Governor and President in Council.

MY LORD,—I have the honour to submit, as directed in the Government Resolution under Mr. Secretary Hart's Memo. No. 1806, of 27th November 1855, para. 5, a report, No. 375, of the 5th June 1857, from Lieutenant Close, late Acting Executive Engineer Dharwar Collectorate, of the administration of Public Works in his District during the year 1856-57. Lieutenant Colonel Kilner has forwarded this report without any remarks. The report is accompanied by a Sketch of the Collectorate.

2. After observing that he has been in charge of the works in the Dharwar Collectorate for about six months only, Lieutenant Close draws attention, in his 2nd paragraph, to the comparatively heavy expenditure on repairs, especially to tanks, in the Dharwar Collectorate, and, in the 11th and 12th paragraphs, explains that these so called repairs and improvements are in fact complete restorations in most

SKETCH MAP of the DHARWAR COLLECTORATE.

Scale 8 Miles to an Inch.

1 0 5 10 20 30

Red dotted lines, show second class Roads opened out.

(Signed) G. Close, Lieutt
Acting Executive Engr. D.C.
June 3rd 1857.

Drawn on Transfer by R. Rozario.

B.E.S. Press

cases, joined often to extensive additional works, and ought to be classed with new works. In this opinion I entirely concur.

3. In the 3rd paragraph a bridge is described, which has been recently completed at Hooblee, at the cost of the Municipality, aided by private subscriptions. This bridge has been built to connect the towns of New and Old Hooblee (para. 20). It has three elliptical arches, each of twenty feet span, was designed by Lieutenant Playfair, and completed by Lieutenant Close, "under the able supervision of Serjeant Overseer Mungavin." The cost was Rs. 4,480.

4. The fair-weather road from Lingunmuth to Dharwar and thence to Behuttee,† thirty-two miles in an easterly direction, has been opened and nearly finished. "The work," in the first of these portions, twenty miles, "has been ably performed by Serjeant Assistant Overseer Fawcett," and as "much assistance has been rendered by convict-labour, the expenditure is," in Lieutenant Close's opinion, "small in comparison with the work done." The other portion, twelve miles, was superintended "by Serjeant Assistant Overseer Coulter, who has done this well" (para. 4). Five miles of a road to connect Maharajpet with the trunk road to Compta at Pala, eight miles west by south, have been opened by Assistant Surveyor and Builder Hurree Dadajee, and the work "has been well done"; but it stops at Kumbusee Kope on the Bombay frontier, and the remaining three miles to Pala are untouched (para. 5). "From Summusghee to Kode (E.S.E.) the road has been opened out a distance of thirty miles. * * * It is a tolerably good road, but in parts runs over a rotten kind of soil, for which it would be advantageous to estimate for a special expenditure" (para. 6). The foregoing seems to be the sum of the work done in opening out communications during the past year, through the Dharwar Collectorate, by the Public Works Department.

5. "The most important of the tanks that have been * * * resuscitated during the past year, are those at the villages of Behuttee, Hebsoor, Satunhullee, Hurreelingudhullee, and Koosoogul"‡ (para. 12).

† Nos. 43 and 44 in Statement 2 of Budget for 1856-57.

‡ Nos. 222 and 284 in Statement 2 of Budget for 1855-56.

Lieutenant Close remarks that the Ryots have generally rendered assistance in the improvement of their tanks, but that they very commonly give trouble by applying for some alterations of the work from the sanctioned plan, and that occasionally they refuse to pay their promised subscriptions when the preliminary labour and trouble of preparing plans and estimates and obtaining sanctions have been gone through (paras. 13 to 15). He also seems to intimate an opinion, in his 16th paragraph, that in the wealthy Collectorate of Dharwar, the townsmen and villagers should generally be able, and ought, to defray entirely the expenses of restoring or repairing wells and tanks, excepting "tanks for irrigation."

6. Lieutenant Close believes that "the new system of Maramut Maistrees lately introduced into this Collectorate * * * fully answers the purpose for which it is intended" (para. 17).

7. Of Mr. Pemberton, Sub-Assistant Executive Engineer, Lieutenant Close writes, after describing the various duties on which that gentleman has been employed during the past official year, that he "has at all times entered upon the duties allotted to him with alacrity, whatever they were. He draws very nicely and surveys correctly" (para. 19). Of Serjeant Overseer Mungavin he reports, that "the workmanship" of the bridge at Hooblee "does him much credit"; and, after enumerating the works on which the Serjeant has been employed, that "the Behuttee Tank improvements, both in point of execution and progress, do Serjeant Mungavin much credit. Serjeant Mungavin has given me every satisfaction in the execution of his duties" (para. 20). Lieutenant Close also reports well of Serjeants Assistant Overseers Fawcett and Coulter. Serjeant Fawcett, he writes, "has given me every satisfaction in the way he has conducted his duties, and is a thoroughly zealous, active, practical man." Serjeant Coulter pushed on a very large work, the repairs to the Hebsoor Tank, rapidly "notwithstanding many difficulties," and Lieutenant Close adds, "has given me every satisfaction, and is a zealous and active man."

8. It is a very pleasing reflection that the reports by Executive Officers of the conduct and abilities of European subordinates in the

Public Works Department have been, almost without exception, equally or even more favourable during the past year.

I have the honour to be,
My Lord,
Your Lordship's most obedient Servant,
C. WADDINGTON, Major General,
Chief Engineer of Public Works.

BELGAUM.

REPORT ON THE PUBLIC WORKS IN THE BELGAUM COLLECTORATE, FOR THE YEAR 1856-57.

The total amount which has been expended, during the year 1856-57, on Public Works, is Rs. 1,00,566-0-11, distributed as follows:—

	Rs.	a.	p.
Roads, Bridges, &c.	52,993	14	5
Ferry Boats	630	7	5
Tanks	1,058	13	5
Military Buildings	40,617	11	0
General Buildings	360	11	1
Territorial Buildings	4,154	2	11
Judicial Buildings	96	12	1
Ecclesiastical Buildings	653	8	7
Total..	1,00,566	0	11

ROADS, BRIDGES, &C.; Rs. 52,993-14-5.

2. The object proposed in the construction of roads and bridges, &c., is evidently to facilitate traffic and thereby to develope the resources of a country. Although this object has been up to this day attained to a certain degree, still much remains to be done. Apart from the consideration of providing monsoon roads, the fair-weather roads that are already in existence require much to be improved. Those which lie to the eastward are almost all in black soil, and, when watered by a few showers of rain, are rendered almost impassable even for pedestrians. If any substantial repairs are to be made to improve them, the rate of ordinary repairs in some cases will decidedly have to be increased to at least Rs. 600 per mile, as some portions run over "Regur," or rich black soil, and have degenerated into mere tracks.

3. Of the description mentioned above the Kulladghee Road is one. The traffic on this road is considerable, and promises to keep pace with its improvement. In 1854, Captain DeLisle, the then Executive

Engineer, with the approval of Colonel Scott, the then Superintending Engineer S. P., increased the average rate per mile from Rs. 20 to Rs. 50 per annum over the whole line; but it is undoubtedly a matter of regret that three years have elapsed and the road is allowed to remain in the same deplorable condition it was in before the rate of repairs was increased. This is in some degree owing to the dishonesty of the Surveyor in charge of the road, who is now undergoing a trial before the Magisterial authorities; otherwise it would have been improved.

4. I may mention here, that the roads in this Collectorate seem to me to have been generally very badly lined out at first, and then being handed over to some of the Collector's subordinates to form the original roadway, it cannot be expected, that with such utter incapacity and inexperience, better work can be performed by them. In my humble opinion, I consider our Department ought to have the origination and completion of all such works.

5. The expenditure under this head is entirely for repairs to the existing roads, which are defective. In order to complete them in a perfect manner, some bridges, &c. are necessary to be constructed over such rivers, nullahs, &c. that intersect them and are yet unprovided with them. Surveys of roads have been ordered with the view of attending to these requirements, and plans, &c. will be forwarded as soon as possible.

6. As for the Kulladghee Road noticed above, it is expected to be one of vastly increased importance, throughout its length, when the Railway is extended from Sholapoor to the Kristna River, which traverses the Belgaum Collectorate. Government having considered it desirable that measures should at once be taken for providing bridges for this road, and for determining what alterations would be necessary to improve the line with the view of providing bridges at the best crossing-places, a Surveyor has been specially appointed for this purpose, and who has marked out another line, which is intersected by fewer nullahs, &c., with better gradients, crossing-places, &c. than the present line possesses.

7. The only roads that have been completed by the Revenue Department during the past year and handed over to the Public Works

Department for repairs, as is customary in this Collectorate, are from Bagulkote to Seroor, a distance of about nine miles, and from thence to Ilkull *viâ* Ameenghur and Hoongoond, a distance of thirty-one and a half miles.

8. The road from Belgaum to the Coast *viâ* the Parpolee Ghaut has, at last, been ordered to be proceeded with, Rs. 1,37,300 already sanctioned for the Tulkut having been made available for this—a most important work, and which will involve more pecuniary responsibility than any yet undertaken in this Collectorate that I am aware of, and will require, as a matter of course, careful and wise superintendence, which is only to be expected in efficient European Officers: this is all that is required to be provided for. Two Assistants are *particularly* required for the Parpolee Ghaut, and as soon as they are placed at my disposal, I will be enabled to proceed with the work at once. The Vingorla Pier, to which this road has been carried, suffered considerable damage during the last monsoon. This happened at a most critical time, when troops were to be embarked for Persia. Some temporary repairs were then executed, so as to make the pier and crane answer for the time. The same kind of repairs have been sanctioned this year to protect the pier from damage during the monsoon, and will be required to be made every year, until a substantial sea-wall, for which plan and estimate have been submitted by me for approval and sanction, is constructed.

9. Since the last eight or nine years the mercantile community of this part of the country have been buoyed up with the hope of obtaining an easier communication from the interior to the coast than by the Ram Ghaut, which presents insurmountable impediments to traffic, in consequence of the bad gradients (1 in 5 and 1 in 3) which obtain on it, thereby baffling every attempt to prevent moorum from being washed off during the monsoon, &c. But some four years must pass away before their expectations can be realized, *i. e.* when the Parpolee Ghaut will be opened to traffic. In the estimate for ordinary repairs to roads for 1857-58 which I have submitted for sanction, provision is made for substantial repairs to the Ram Ghaut, in order to remedy, as far as possible, the evil complained of.

10. Plan and estimate have also been submitted for sanction for clearing a new line of road between Sounduttee and Munolee, two places of the highest importance in the Pursgurh Talook, the former being the head-quarter station of the Mamlutdar of the Talook, and also the place where the Moonsiff of the District holds his court; also possessing a well-attended and first-rate bazaar; the latter also being altogether a manufacturing and trading town, possesses considerable importance in a commercial point of view. There is at present a road connecting the two towns abovementioned. It was at first proposed by the Collector's Department to improve it. But the same being faulty in direction, &c., Major General Waddington objected to the proposal, on the ground that the improvement of the old road would cost more than the clearance of a new one. A ghaut intervenes between the two towns over which the old road runs; the proposed new road goes parallel to it, but the gradients are far better than those on the old, the former being 1 in 12 and the latter 1 in 20 nearly. When this road is completed, it will tend materially to promote industry, &c. and thereby increase traffic.

FERRY BOATS, Rs. 630-7-5.

11. During the past year two boats have been sanctioned to be constructed, one for the ferry over the Kristna River at Kortee on the Hooblee and Sholapoor Road, and the other for the Vedgunga River near Yemgurnee on the road from Belgaum to Kolapoor; the former was sanctioned so far back as June, and the latter August 1856, by the Chief Engineer of Public Works, but neither has as yet been established. The delay in the building, &c. of the same is quite unavoidable; the cause has been reported to Government through the regular channel, in reply to a reference made by them, viz. the want of suitable wood, which is, in fact, owing to the very injudicious arrangements made by my predecessors for this, one of the most important building materials. I, however, expect to get wood in a short time, if not disappointed once more by the Forest Department, when the boats will be put in hand.

12. It is necessary to remark here, that estimates for ordinary

repairs to the existing boats, for 1857-58, have not been forwarded by me for sanction; the Magistrate of Belgaum having intimated to me that the Ferry Contractors have entered into an agreement with him to repair them, with the exception of the iron boat at Yeddoor, which should only continue to be repaired by this Department.

TANKS, Rs. 1,058-13-5.

13. The expenditure is entirely for repairs to the existing tanks, which, having been allowed to fall into disrepair for many years, were rendered incapable of supplying water even for domestic purposes.

14. The inhabitants of some villages provided with such tanks at present have contributed certain sums for the improvement of their tanks, and have also obtained equivalent grants-in-aid from Government. It does not come within the sketch of this report to detail at length the benefits they, in common with the State, will derive by clearing their tanks every year and keeping them in every way in a proper state of repair: I shall therefore confine myself to enumerating such as have been sanctioned during the past year, and have been and are being repaired, as well as such as have been surveyed, &c. &c.

15. Rupees 1,000 have been sanctioned by Government for repairing the tank at Manikuttee in the Pursgurh Talook. From a letter which Mr. Bell, the late Collector of Belgaum, has written to Captain DeLisle, the then Executive Engineer, I perceive that this tank was first partially repaired by the Mamlutdar of the Talook, but the same being originally defective in construction, and requiring more substantial repairs to make it effectively and permanently available for the domestic purposes of the villagers, a grant was obtained from Government for this purpose. This work not having been executed by this Department, and having never been visited by me, I am unable to judge whether it has been successful or otherwise.

16. In the same Talooka another tank, situated at the village of Kurrikuttee, has been repaired under the superintendence of the Collector's Department. Rupees 2,000 were granted by Government to complete this tank, the Revenue Commissioner Southern Division

being of opinion that with this amount it could be made subservient to the irrigation of a portion of the extensive tract of black soil around it. This view was communicated to Lieutenant Wilkins, the then Acting Executive Engineer B. C., who stated that, "considering the size of the tank, its depth, and construction, I am of opinion that when it will be improved by the expenditure of the Government sanction of $\frac{2000}{2}$ Rupees *now received,* that the tank will only then be able to answer the requirements of the villagers of Kurrikuttee, and that it cannot contain sufficient water even to irrigate a small portion of the black soil plain around it."

17. Until the work comes under my personal inspection, I shall be unable to form any opinion as to its failure or otherwise, since it has been executed under non-professional superintendence.

18. Rupees 127-1-8 have been expended on the tank at Sounduttee. Out of the amount (Rs. 4,689) sanctioned by Government for repairs to this tank, the towns-people have contributed a sum of Rs. 2,003, the remainder having been permitted to be laid out of the Government Treasury. I beg to remark that when the improvements as per estimates have been made, I have no doubt it will answer all purposes.

19. A sum of Rs. 770-7-3 has been expended for repairs to the tank at Neepanee, where the want of water is greatly felt. Water, therefore, is brought from a distance, by means of an aqueduct, the construction of which is said to have originally cost about five lakhs of Rupees. It is to be lamented that this grand piece of work, on which alone the population of Neepanee, numbering about 7,500 souls, depend for one of the principal necessaries of life, is neglected.

20. The amount sanctioned for repairs to this tank is Rs. 3,780, out of which 2,000 Rupees have been contributed by the villagers; the remainder is to be borne by Government.

21. Plan and estimate, the latter amounting to Rs. 12,150, have lately been submitted by me for repairing the large tank situated near the western gate of the Fort of Belgaum. This tank is almost filled up with mud; consequently retains little or no water in the dry season. It is therefore proposed to excavate a catch-water

drain, which will increase the water of the tank; to remove the mud, &c. which has accumulated; to repair the bund, and to make a road over it. The track which at present exists causes very great inconvience to the neighbouring villagers, who have to frequent the bazaar of Belgaum, &c.

22. This tank at present irrigates about 484 acres of land, which yields an annual revenue of Rs. 1,778-8-0. I am of opinion that this work should be performed by this Department.

MILITARY BUILDINGS, Rs. 40,617-11-0.

23. The married soldiers' quarters, the powder magazine, and enlarging the quarter-guard of the European Regiment, two cook-rooms out of the three sanctioned, and an armourer's forge, and the bathing-places for the married soldiers of the 3rd Company 1st Battalion Artillery, are the only principal works that have been completed during the last year. The new magazine has been provided with moveable copper-fastened boarded floor over its stone pavement, at a cost of Rs. 1,291-7-4; some more additions having been recommended by Captain Biggs, Commissary of Ordnance S. D. A., viz. the construction of two porches to the doors, opening on the north, in order to prevent the south-west rain beating in and thereby moistening the powder. A plan and estimate have lately been sent in by me for the necessary means of preservation, &c.

24. The construction of the third cook-room is awaiting the final orders of His Excellency the Commander-in-Chief.

25. Rupees 15,118-14-10 was expended last year on alterations to three barracks of the European Regiment. Three-fifths of this work is completed.

GENERAL BUILDINGS, Rs. 360-11-1.

26. Under this head no new buildings were erected during the last year. A building with out-offices for Telegraphic purposes, at Belgaum, has, however, been sanctioned, to be constructed at a cost of Rs. 6,260. It is my intention to have this, as well as some other buildings, performed by contract, and have therefore submitted tenders for sanction.

27. A plan and estimate for a new Post Office at Belgaum, the latter amounting to Rs. 8,091, have been forwarded by me for sanction. This plan is of a first class building. The Inspecting Postmaster of Belgaum had proposed to purchase a building in which he at present holds his office as a temporary measure; but my personal examination led me to object to this proposal, not only on account of its situation, but the decayed state in which it is at present, which altogether precludes the idea of the building lasting for a sufficient length of time to warrant its purchase.

TERRITORIAL BUILDINGS, Rs. 4,154-2-11.

28. With the exception of the Padshapoor Mahal Cutcherry and the Sumpgaum Mamlutdar's Cutcherry, which were only completed during the past year, no new buildings have been constructed. Plans and estimates for three new Cutcherries at Belgaum, Sounduttee, and Beeree, were sent for sanction, but Government having desired that they should be according to a standard plan, which they have since circulated for guidance, the plans have been prepared according to that approved of by Government, with such modifications as are rendered necessary by the circumstances of the different localities.

29. Rupees 427-6-10 have been expended on the construction of a new Customs Chowkee at Tullawarree, in the Beedee Talook of this Collectorate, on the 13th August 1856. This building was sanctioned by Government to be erected at a cost of Rs. 839, but it was not till Lieutenant Goodfellow explained his objections to using the tower at the same place as a Customs Chowkee by re-building such portions as were destroyed, that the work was put in hand. The objections raised by Lieutenant Goodfellow were as follows :—

"1st. It would not afford sufficient accommodation.

"2nd. The only means of egress and ingress is by way of a small trap-door, about two and a half feet square, situated about twelve feet high from the ground, which is approached by means of a common ladder removeable at pleasure.

"3rd. A Chowkey should be an open building to be a convenient one.

"4th. If the tower is converted into a Chowkey, it will no longer be what it now is, a place of considerable strength."

30. This Chowkey is now near completion.

JUDICIAL BUILDINGS, Rs. 96-12-1.

31. The whole of this amount has been laid out on repairs to the existing Court-houses.

32. These buildings having been considered deficient in accommodation, a plan and estimate, the latter amounting to Rs. 6,844, and adapted to this District, have been submitted by me. This plan contains all the accommodations considered necessary by Government and the Judges of the Sudder Adawlut.

ECCLESIASTICAL BUILDINGS, Rs. 653-8-7.

33. Of this amount, a sum of Rs. 242-15-10 has been expended on repairs, the remainder having been laid out on the Church, which is being constructed in Camp on the "old site" finally approved of by Government.

34. On taking a retrospective view of all the works that have been performed during the last year, there are none that have been otherwise than successful, except the ordinary repairs to the Kulladghee, Dharwar, and Arbhavee and Nurgoond Roads, and, in fact, everything executed under the superintendence of Pudmon Manickjee. These roads are in the same state in which they have been known to be for years past. This failure is, as a matter of course, attributable to the dishonesty of the Surveyor, and in no less degree to the entire want of efficient superintendence which is felt in this Collectorate. One Officer cannot possibly be expected to superintend a whole District, which extends over an area of 6515·69 square miles, with that amount of precision which is necessary to be observed in the Public Works Department.

35. Before entering on what remains to be done in the District, I would beg to remark, and trust I may not be expected to enumerate the requirements of this District and detail them at any greater

length than what I have done below, having, in reality, no Assistants to aid me in my executive duties, &c.

36. Irrigation is the first thing needed. Of the three principal projects mentioned in the last report, only one has undergone sufficient investigation, viz. the first project, which is for the irrigation of the Bagulkote Talook by means of a canal cut from the Kristna and Ghutpurba Rivers, for which detailed plans and estimates have been prepared by C. R. Atkinson, Esquire, Civil Engineer for the Irrigation Company. But in consequence of the remarkable deficiency of the means at my disposal, I have been unable to pursue any further the investigation of the other two schemes, *i. e.* one for the irrigation of portions of the Pursgurh Talook from the river Mulpurba, and the other for the irrigation of the extensive plains lying between Nurgoond and Roan, and also between Sounduttee and the limits of the Dharwar Collectorate to the southward, by means of a Bundara across the Mulpurba, where that river enters the hills between Sounduttee and Munolee.

37. It is quite probable that portions of the extensive black soil plains, which lie waste to the east of this Collectorate, can be watered by other means, although on a comparatively small scale, *i. e.* by means of tanks, which are very numerous in those parts, and, if properly repaired, will render the soil which surrounds them to a certain degree fertile and remunerative.

38. The second requirement is, the opening out of the country by the improvement of the present roads, and by the construction of new ones, which is equally essential for the improvement of the District. The trunk road from Kolapoor to Belgaum and Dharwar will be greatly improved when the drains between Bootramhuttee and Sootguttee, which are now in progress, will have been completed. But this road crosses five large rivers, none of which are bridged, but three of them are at present crossed by flying bridges. For the other two, plans and estimates will be forwarded immediately.

Agency available or desirable, &c.

39. During the time I have had charge of the executive duties of this Collectorate, I have had no assistance whatever in the shape of

superior subordinates, *i. e.* Assistant Executive Engineers. I need not bring this to notice, as perhaps Government are well aware of the fact; nevertheless I deem it my duty to do so. This has been the cause of my continual attendance in Camp, at a very great pecuniary loss to me, as I get less pay now than I would have had at the Wurrandah Ghaut in the Sattara Collectorate, under Captain Kennedy; and besides, the numerous Military buildings progressing in Camp, as a matter of course required constant supervision. The want of Assistants is greatly felt in this Collectorate, and new projects, &c. have necessarily been delayed in consequence of the want of efficient Officers to undertake works that require superior ability, &c.

40. Mr. Atkinson, Civil Engineer, I may say, has been of no assistance whatever to me, as he has been employed entirely on the irrigational works, which, I was in hopes, would have been passed on through me to Government; but I am sorry to say that a recent letter from Government to Mr. Atkinson has prevented this being done, and I have lost the services of a very efficient Officer. I may, in conclusion, beg to offer a suggestion in expressing a hope that more Assistants be allowed to this Collectorate; being so extensive, there ought, in my opinion, to be at least four efficient Assistant Executives. Without that number, we shall never be able to keep pace, as we wish and should do, in the progress of Public Works; and work, moreover, will never be satisfactorily executed without that number at the very least.

W. R. Houghton, Captain,
Acting Executive Engineer, B. C.

No. 1732 of 1857.

Public Works Department.

Superintending Engineer's P. Office,
Sattara, 4th July 1857.

To the Chief Engineer of Public Works, Bombay.

Sir,—With reference to your Assistant's No. 3356, of the 25th ultimo, I have the honour to return the report on the principal works

in Belgaum by Captain Houghton, accompanied with his explanation (No. 521, of 30th ultimo) of the discrepancies noted in your Memo. above alluded to.

2. Confining my observations to the Belgaum Collectorate itself, I may say that the Public Works Department there is effective and useful, considering its present complement of Executive Officers and subordinates. It has been of indisputable benefit to the trade, by constantly keeping the communications between the towns and villages in traversible condition; it constructs works for Government, and devises means, in such extent as its power admits, to remedy any existing public inconvenience, or to improve the comfort of the community. This I may safely apply as a general observation with regard to the Department throughout the five Collectorates and one Principality of this Province. But in Belgaum little has been done to develope the resources of the country, and make it remunerative to Government for the expense and trouble lavished on it. To do this, it is apparent, is a work of studious attention to the wants of the country, and can be best conducted only with the advantages of local experience and even inquiry into the subject by the Executive Engineer. I attribute much of our straggling in this respect hitherto, first to the constant removal of Executive Engineers, which leaves to every succeeding Officer the same Sisyphus task of speculating anew upon this or that as a sanitary improvement to the country; and next, to the deficiency of assistance to relieve the Executive Engineer of the trouble of attending to trifling works, to repairs, and correspondence. For the last half-year there has been no such assistance given, for Mr. Atkinson was almost exclusively employed (when he was not in charge of the Office) on the Bagulkote Survey, and Lieutenant Goodfellow at the present moment is on special duty. If there is a little more assistance, I doubt not that there will be many more projects contemplated. Of the interior economy of the Department, Lieutenant Wilkins's last year's report, and the present one from Captain Houghton, will clearly lay everything before you. I have, I beg to add, great dependance on the foresight and intelligence of Captain Houghton to meet every exigency of his charge, as well as to provide for its future improvement.

He has himself in his report mentioned how he could best turn to account his own knowledge; but I do not think Belgaum requires four Assistant Executive Engineers just yet.

I have the honour to be,
Sir,
Your most obedient Servant,
J. KILNER, Lieutenant Colonel,
Superintending Engineer Southern Province.

No. 4104 of 1857.

PUBLIC WORKS DEPARTMENT.

Office of Chief Engineer of Public Works,
Bombay, 4th August 1857.

To the Right Honorable LORD ELPHINSTONE, G.C.H.,
Governor and President in Council.

MY LORD,—In compliance with the instructions in the 5th paragraph of the Government Resolution under Mr. Secretary Hart's Memo. No. 1806, of the 27th November 1855, I have the honour to submit a report from Captain Houghton, Acting Executive Engineer Belgaum Collectorate, of the operations of his Department for the year 1856-57, together with a letter from Lieutenant Colonel Kilner, No. 1732, of the 4th July 1857, commenting on the report, which was returned to him for that purpose.

2. Captain Houghton begins his report with a statement of his expenditure in 1856-57, amount Rs. 1,00,566, arranged under eight heads. This is followed by some general remarks upon roads, which appear to me confused and inconsistent. With regard to fair-weather roads over black soil, he gives his opinion that "the rate of ordinary repairs in some cases will decidedly have to be increased to at least 600 Rupees per mile" (para. 2). Yet, in the following paragraph,

Captain Houghton seems to write approvingly of "the average rate per mile" on the Kulladghee Road, which he explains to be one "of the description mentioned above," having been increased in 1854 by Captain DeLisle "from Rs. 20 to Rs. 50 per annum"; for though he states it "as a matter of regret that three years have elapsed and the road is allowed to remain in the same deplorable condition it was in before the rate of repairs was increased," yet he explains that this is in some degree owing to the dishonesty of the Surveyor in charge of the road, who is now undergoing a trial before the Magisterial authorities; otherwise it would have been improved."

3. In the 4th paragraph again, Captain Houghton remarks that "the roads in this Collectorate seem to me to have been generally very badly lined out at first," yet goes on in the 5th paragraph (apparently writing about the same roads) to give his opinion that "in order to complete them in a perfect manner, some bridges, &c. are necessary"; adding that surveys of roads have been ordered with a view of attending to these requirements, and plans, &c. will be forwarded as soon as possible."

4. "As for the Kulladghee road noticed above," we are informed in Captain Houghton's 6th paragraph that "it is expected to be one of vastly increased importance, throughout its length, when the Railway is extended from Sholapoor to the Kristna River," and that to meet the wishes of Government, "a Surveyor specially appointed for this purpose * * * has marked out another line, which is intersected by fewer nullahs, &c., with better gradients, crossing-places, &c. than the present line possesses."

5. With respect to the formidable expenditure on roads and bridges exhibited in the 1st paragraph of Captain Houghton's report, Rs. 52,994, it is explained in his 5th paragraph that "the expenditure under this head is entirely for repairs to the existing roads." The only sum spent otherwise by the Public Works Department during 1856-57 was Rs. 1,211, in completing the Benhulli Bridge as I am elsewhere informed.

6. From the 7th paragraph of the report it appears that a clearance from Bagulkote to Seroor, nine miles, and thence by Ameenghur

and Hoongoond to Ilkull, 31½ miles, has been completed during the past year by the Revenue Department, and "handed over to the Public Works Department for repairs, as is customary in this Collectorate."

7. The new road from Belgaum to the Coast "will require, as a matter of course, careful and wise superintendence" (para. 8); and Captain Houghton adds, that "two Assistants are particularly required for the Parpolee Ghaut, and as soon as they are placed at my disposal I will be enabled to proceed with the work at once." Your Lordship in Council has specially appointed Lieutenant Goodfellow for the prosecution of this work. The 10th paragraph informs us that "plans and estimates have also been submitted for sanction for clearing a new line of road between Sounduttee and Munolee, two places of the highest importance." By the 11th paragraph we learn that two ferry boats, sanctioned respectively in June and August 1856, for the Kristna River at Koortee and the Vedgunga River near Yemgaum, have not yet been commenced for "want of suitable wood, which," Captain Houghton continues, "is in fact owing to the very injudicious arrangements made by my predecessor for this one of the most important building materials."

8. In paras. 13 to 22 Captain Houghton describes the improvements of tanks which have been proposed or sanctioned during the past year in the Belgaum Collectorate. They are of little importance, and almost nothing seems to have been actually done by the Public Works Department either for irrigation or a supply of drinking water in 1856-57. In the 19th paragraph allusion is made to "an aqueduct, the construction of which is said to have originally cost about five lakhs of Rupees," but the supply from which appears to be inadequate to the wants of the people of Nepanee, for Captain Houghton remarks—"It is to be lamented that this grand piece of work, on which alone the population of Nepanee, numbering about 7,500 souls, depend for one of the principal necessaries of life, is neglected."

9. Paras. 23 to 25 describe what have been executed in the Military Department. In the Infantry Lines the married soldiers' quarters have been finished, as also the quarter guard-room, two cook-rooms, and an armourer's forge. The alterations to three of

the barracks have been considerably advanced. In the Artillery Lines, bathing-places for the married men have been built. The powder magazine has been provided with a moveable copper-fastened plank floor over the stone pavement, an improvement originally introduced by me in this Presidency, and which has been found so serviceable that it is now generally adopted.

10. The Padshapoor Mahal Cutcherry and the Sumpgaum Mamlutdar's Cutcherry are reported in the 28th paragraph as completed in 1856-57, and a new Customs Chowkee at Tullawarree as nearly so. The Church in the Cantonment of Belgaum appears also by para. 33 to have been at last recommenced.

11. In his 34th paragraph, Captain Houghton alludes to the dishonesty of a Surveyor of old standing, Pudmon Manickjee, as the chief cause of failure in the "ordinary repairs to the Kulladghee, Dharwar, and Arbhavee and Nurgoond Roads." From the 3rd paragraph of the report an extract has already been given, showing that the charges against this man were under investigation by the Civil authorities. Captain Houghton also complains of "the entire want of efficient superintendence which is felt in this Collectorate," and, in his 35th paragraph, of "having in reality no Assistants to aid me in my executive duties, &c." The following is a list of Captain Houghton's establishment:—

European Overseers.	*Surveyor's and Builders.*		
Serjt. Overseer Clabby.	1st Class Surveyor and Builder		Pudmon Manickjee.
Serjt. Asst. Overseer Daly.	2nd Class Asst. Surveyor & Builder		G. Sandford.
	1st Class Sub-Asst.	Do.	C. Hanson.
	Do. Do.	Do.	Hurrichund Sadasewjee.
	2nd Do. Do.	Do.	Wittul Luximon.
	1st Class Sub-Surveyor		Shreedhur Venayeck.
	Do. Do.		Narro Bhickajee.
	2nd Do. Sub-Overseer		Gunnesh Wittul.

12. In his 36th paragraph, Captain Houghton gives his opinion that "irrigation is the first thing needed," and refers to "three principal projects" which had engaged attention previously to last year. Captain Houghton attributes to "the remarkable deficiency of the means at (his) disposal" his inability to pursue the investigation of two

of the "schemes, one for the irrigation of the Pursgurh Talook from the River Mulpurba, and the other for the irrigation of the extensive plains lying between Nurgoond and Roan, and also between Sounduttee and the limits of the Dharwar Collectorate to the southward, by means of a Bundara across the Mulpurba, where that river enters the hills between Sounduttee and Munolee." * * * "Of the three principal projects" above alluded to, Captain Houghton states that "only one has undergone sufficient investigation, viz. the first project, which is for the irrigation of the Bagulkote Talook by means of a canal cut from the Kristna and Gutpurba Rivers, for which detailed plans and estimates have been prepared by C. R. Atkinson, Esq., Civil Engineer, for the Irrigation Company."

13. "The second requirement," according to Captain Houghton, "is the opening out of the country by the improvement of the present roads and by the construction of new ones." Captain Kennedy was of opinion (and I think justly) that works to improve the communications of the country should precede works of irrigation. Captain Houghton goes on to remark that "the trunk road from Kolapoor to Belgaum and Dharwar will be greatly improved when the drains between Bootramhuttee and Sootguttee, which are now in progress, will have been completed. But this road crosses five large rivers, none of which are bridged, but three of them are at present crossed by flying bridges. For the other two, plans and estimates will be forwarded immediately." This road was described in my letter No. 8791, of 22nd October 1856, with which the estimate for the drains was submitted.

14. Captain Houghton's last two paragraphs enter on the subject of the agency which he considers desirable, and the want of assistance which "has been the cause of (his) continual attendance in Camp." He thinks that "to this Collectorate, being so extensive, there ought * * * to be at least four Assistant Executives." With regard to subordinate assistance he is altogether silent. Lieutenant Colonel Kilner, in concluding his remarks on this report, which are very general, and require no notice from me, writes—"I have, I beg to add, great dependance on the foresight and intelligence of Captain Hough-

ton to meet every exigency of his charge, as well as to provide for its future improvement. He has himself in his report mentioned how he could best turn to account his own knowledge; but I do not think Belgaum requires four Assistant Executive Engineers just yet."

15. I agree with Lieutenant Colonel Kilner in the opinion last quoted, as to the four Assistant Executive Engineers being not yet required. Some additional qualified assistance would doubtless be of much advantage in the Belgaum Collectorate, as in some other Collectorates, were such available. The efficiency of the Public Works Department in that Collectorate will, however, be more materially promoted, in my opinion, by the return of Captain Dickinson from field service and his assumption of the appointment of Executive Engineer Belgaum Collectorate, to which he has been nominated; and I confess that I look forward to his return for considerable improvement in the effectiveness of the Public Works Department, so far as the Belgaum Collectorate is concerned.

I have the honour to be,
My Lord,
Your Lordship's most obedient Servant,
C. Waddington, Major General,
Chief Engineer of Public Works.

No. 165 of 1857.

Public Works Department.

Office of the Executive Engineer Rutnagherry Collectorate,
Camp near Phonda, 19th June 1857.

To Lieutenant Colonel Kilner,
Superintending Engineer Southern Province.

Sir,—I now beg to report concerning the works upon which I have been engaged during the past year, as follows:—

First, as regards the new line of road over the Phonda Ghaut, eight miles long, estimated to cost Rs. 1,35,638, and begun on the 13th of August 1855. The cutting was very nearly completed on the 30th of April, and certainly would have been quite finished before, had not surveys of new projects prevented my close attention in person. At the date named, seven and a quarter miles had been opened to a *minimum* breadth of *twenty-eight* feet, with an average breadth at sharp salient turns of *thirty-two* feet; the *remaining* three-quarters of a mile averages twenty-two and a half feet; and the breadth required in addition can be gained in many places, and re-entering curves improved by fillings of stone with outward breast walls.

Phonda Ghaut, total length 8 miles.

Opened out 7¼ miles, to a breadth of 28 feet, at turns of 32 feet. Remaining ¾ mile, width 22½ feet.

2. Along nearly four miles of the road the hill cutting has been sloped (occasionally stepped), *one-third* to one in the hardest moorum, *half* to one in tolerably firm soils, and *three-quarters* to one in others. In some steep places, where *débris* and loose rock are overlying compact rock or hard moorum having a smooth surface, the former have slid away to *one and a quarter* to one; such slips extending, in two particular instances, more than one hundred feet upwards, and having so threatening an aspect that no person would venture under them on heavy rain falling. Again, there is a peculiar kind of moorum, having a great depth below the

Four miles Hill-side Cuttings sloped.

Land-slips 100 feet.

original surface, which, notwithstanding that one to one was originally allowed in cutting through it, has continued to cave in and crumble away during the whole of the dry weather. This soil presents the same appearance which a loosely formed moorum embankment would if dug away, and will not remain at a steeper angle than the natural one of repose, unless support be afforded by the roots of trees or retaining walls.

Loose nature of Soil, remarks on.

3. Instead of giving the faces of cuttings a regular slope, a few have been formed into steps; not that it is expected these steps will remain for any length of time—of course they will not,—but in the hope that they will detain the various kinds of seeds which the rain will wash down, and last just long enough to permit of their sprouting up and taking root, which upon a smoothly cut slope they have little chance of doing. This is a mere experiment, upon the success or otherwise of which the plan will be followed or abandoned.

Cuttings finished in steps.

To promote the growth of Vegetation.

4. It has been remarked of this Ghaut, that it involves less solid rock-cutting than any other which has yet been made; it will consequently be expected to be less costly, in proportion to its length, than any other Ghaut road. The present monsoon will decide this question; the full breadth, and somewhat more, having been finished in all soils likely to give way. I much fear, however, that there will be some serious land-slips, the clearing away of which will entail expense in proportion to the difficulty laborers must experience in handling heavy boulders and masses of rock when slippery with mud.

More Slips apprehended.

Boulders in mud difficult of removal.

5. All the side embankments previously completed were sown with Natchnee, and stood remarkably well during last monsoon; in fact, not one was in the least degree injured; and at the beginning of the approaching season it is intended to give thistle and castor-oil seeds *also* a trial. The plant last alluded to is of a very rapid growth, thrives well in this locality, and its broad leaves will break the force of the heavy showers common to the line of Ghauts, and so destructive to newly formed earth-works.

Sowing Embankments.

6. The cutting of the Syadree Ridge had been made to the full depth of 43½ feet on the 30th April last, but its sole and cheeks remained to be levelled and trimmed, as also some loose material removed. No compact rock occurred at the abovenamed depth, but that latterly met with was very difficult to get out, blasts having very little effect, whilst it was a tedious business, through the quarrymen being too much crowded in a limited space to work in a proper manner; consequently, also, was not so economically performed as a similar kind under different circumstances would have been.

Great Ridge-cutting.

7. Had it not happened, during the two seasons this Ghaut has been in progress, that there was a suspension of operations on account of the "Hoolee" (after which a very limited number of labourers returned to the work until the rice had been transplanted), the cutting would certainly have been finished some months ago.

Progress retarded by the "Hoolee."

8. Seeing that various other works have been carried on simultaneously with the cutting, involving an expenditure of money and labour equivalent to that necessary to increase three-quarters of a mile now remaining, twenty-two and a half on the average, to twenty-eight feet wide, I may be permitted to *assume* the simple earth-works *as completed* on the 30th of April, and take this opportunity of stating the *time* occupied, and average number of *work-people* engaged thereon. Say, then, from the 13th of August 1855 up to 30th of April 1857, a period of twenty and a half months (seven and a half being monsoon), are equal to 625 days; deducting Sundays and holidays, 141 days, leaves a balance of *working* days 484; to be divided into the aggregate number of days for which all classes of labourers were mustered, namely 451,194. The result is, that the cutting of the Phonda Ghaut, eight miles long and twenty-eight feet broad, was executed by 932 *labourers* in 484 *days*, 232 of which were *monsoon*.

¾ mile.
22½ feet.
28 do.

Time occupied (assumed).

Labour employed in the Earth-works calculated.

Result 8 miles, 28 feet wide.

9. Of course it is not meant that the work was expeditiously performed—rather the contrary; it can only be said that it was carried out as quickly as the limited number of labourers admitted, which limited number was as great as an establishment (consisting of one Inspector and two Native Overseers), untaught and inexperienced, could with economy control. Sub-Assistant Surveyor and Builder Balajee Mahadeo has been employed on this work *only* about seven months; he needs *practice.*

Number of Labourers limited, Establishment being inefficient.

Sub-Assistant Surveyor and Builder.

10. During the past year the expenditure amounted to Rs. 38,379.* The work executed will be seen from the following Tabular Statements—(A) showing the length and breadth to which the road has been opened in different soils up to the 30th April 1857; (B) numerically the works executed during the year, with deduced rates; and (C) building and other materials prepared during the same period.

Reference to Statements.

(A)

TABLE *showing the Length of Line over the Phonda Ghaut in different Soils, and the Breadth to which the Road had been cut or embanked up to, on the* 30*th April* 1857.

Construction.	Length.	In what Soil.	Breadth Opened.
	Feet.		Feet.
SIDE CUTTING ON HILL.	1,770	Solid hard rock	24
	1,850	Rock of kinds	21
	9,715	Decomposing rock, loose rock, and great boulders requiring blasts	28
	4,450	Boulders in earth, &c.	28
	1,610	*Very* hard moorum	28
	3,500	Ordinary firm moorum	28
	18,055	Soils not difficult	28
RIDGE CUTTING.	350	Chiefly decomposing rock	24
	80	Ditto ditto	24
EMBANKING.	860	With moorum, &c.	28
	42,240	Equals 8 Miles, *Total length of Ghaut.*	

* Vide para. 11.

(B)

TABLE *exhibiting numerically the Works executed during the Year* 1856-57, *and Mean Rates deduced from actual performance, from the Commencement of the Work in August* 1855, *contrasted with those Estimated by.*

Nature of Work.	Quantity executed during 1856-57.	Rate as Estimated by.			Rate deduced from actual performance, from commencement to present time.		
	Solid feet.	Per 100 feet.			Per 100 feet.		
		Rs.	*a.*	*p.*	*Rs.*	*a.*	*p.*
Hill-side Cuttings.							
In solid rock	286,654	2	8	0	2	3	2
In very hard moorum, difficult to dig or blast	429,647	0	12	0	1	0	10
In loose rock and boulders	2,154,552	0	12	0	0	14	4
In earth and boulders	1,026,290	0	8	0	0	5	2
In ordinary moorum	405,270	0	4	0	0	3	0
In other soils	3,041,964	0	2	6	0	2	4
Ridge Cuttings, the Materials removed 100 *yards.*							
In decomposing rock, &c.	97,852	1	6	0	1	2	1
Embanking and Filling.							
With moorum, &c.	118,480	0	8	0	0	5	4
Excavation of Side Channels.							
In all soils, rock excepted	26,400	2	0	0	0	13	7
Dry Walling, Hammer-dressed.							
Of circular masonry, at a salient return	2,000	7	8	0	7	7	2
Sundry Works.	Miles.	Per mile.			Per mile.		
Clearing away overhanging trees, &c. ; trimming slopes	4½	150	0	0	158	3	5
Levelling roadway, and preserving it during the monsoon	7¼	330	0	0	*49	10	4

* NOTE.—The latter work will have to be repeated many times, until settlement shall cease and a firm surface be obtained.

(C)

TABLE *showing Materials prepared for Masonry Works, &c. &c., during the Year* 1856-57, *and the Rates thereof.*

Description of Materials.	No. or Quantity.	Deduced Rates.			Per
		Rs.	*a.*	*p.*	
Lime made from stone ..... Deccanee Kundees	60	9	11	5	Kundee.
Metal (blue rock) ..... Solid feet	43,160	2	4	4	100 feet.
Boulders broken up into rubble and piled .... Do.	66,801	0	14	1	Do.
Slab stones 5 feet long ..... No.	111	0	9	11	Each.
Do. 3¾ do. ..... No.	564	0	3	10	Do.
Do. 2¾ do. ..... No.	859	0	2	1	Do.
Corner stones, mostly cut	128	0	7	2	Do.
Large Khandkies and building stones of sorts .... No.	2,295	0	0	8	Do.

11. The *Expenditure* during the past year was :—

Expenditure.

For Labour and Materials .. Rs.	37,308	15	3
For Contingencies, which include huts for sheltering the labourers during the monsoon, supplying them with water, repairing tools, carriage of materials, &c. &c. ..	356	2	10
For Superintending Establishment	713	12	4
Total during 1856-57.... Rs.	38,379	0	0
And ADDING thereto that incurred *since the commencement* of the work in August 1855....	25,867	0	0
Makes a Grand Total of.... Rs.	64,246	0	0

Per-centage of Contingencies, &c.

Contingencies were in the proportion of 3·72, and cost of *Superintending Establishment* 2·54 per cent. on the *actual outlay* for the *whole* period.

Travellers' Bungalow Improvements.

12. Thorough repairs and improvements, with additions, to the Travellers' Bungalow at Dajeepoor, sanctioned at a cost of Rs. 1,265, have been completed, with the exception of plastering, earthen flooring, and interior finishing works. These improvements consist of the removal of superfluous apartments, raising the main walls two feet higher than formerly, adding a verandah ten feet wide with four partition walls therein, and building two new bath-rooms and a cook-house.

WORK EXECUTED.

	Solid feet.
Superfluous walls removed	4,555
Apertures blocked up with masonry of stone and mud, and dry masonry built	1,652
Foundations dug in moorum	1,602
Do. filled with stone and lime	1,002
Walls of cut-stone masonry built	3,793
	Supfl. feet.
Roofing fixed (partially)	5,531
Pavement laid	421

13. Repairs to five of the temporary wooden bridges on the present road between Phonda and the top of the Ghaut, sanctioned on emergency at a cost of Rs. 100, have been made. An excess of Rs. 26-8-2 has been incurred, owing to its having been found necessary to rebuild entirely two of the largest, whose posts and girders had been reduced to mere shells by white-ants; which circumstance was not ascertained until the superstructure had been removed.

Repairs of Wooden Bridges.

14. The works below enumerated have been carried out at the Station of Rutnagherry:—

Station of Rutnagherry, Works at.

	Supfl. feet.
1st. Terrace at the Adawlut.....	3,328
2nd. Defects in Contractor's work (Collector's Cutcherry and Treasury-room) remedied Departmentally. New bolts fixed	No. 48
3rd. A new foot-path, leading from the Sepoys' Lines to a well in the ravine, seven feet wide.....	Run. feet. 245

4th. Ordinary repairs to Military and Judicial buildings executed, and some other trifling works executed.

15. The usual repairs to the roads between Hurnee and Dapoolee, as also Rutnagherry towards Hathkumbé, and to the track up the Phonda Ghaut, have been made.

Repairs, Roads.

16. *Surveys, Plans,* and *Estimates,* for the following new projects, were submitted during the year, viz:—

Surveys, Plans, and Estimates submitted.

1st. For a perfect road, bridged and drained throughout, between the *Phonda Ghaut and Waghotun,* at an estimated cost of Rs. 1,39,868, length of road 27½ miles. This line has been definitely marked out, by gauge-paths along the hilly portions levelled, and by stone-piles elsewhere.

2nd. A survey of the *new line* over the *Phonda Ghaut,* with amended designs, and revised estimate, amounting to Rs. 1,35,638.

3rd. For a watercourse and cistern, to supply the town of Waghotun with water; one design estimated at Rs. 2,500, and another at Rs. 753.

4th. Five designs and estimates for Bunds to reclaim salt marsh lands, Rs. 34,695.

For reclaiming Land.

17. Lines laid down, surveyed, and marked out (designs in hand):—

New Lines laid down and surveyed.

1st. For a road between Phonda Ghaut and Malwan, length 36 miles.

2nd. For a road between the foot of the Koombarlee Ghaut and Chiploon Bunder, length 12⅓ miles.

3rd. Survey of Camp roads in the Station of Rutnagherry, and two new Ghaut lines, practicable for carts, to connect the Station and Bunder, 4 miles (plan finished).

I have the honour to be,
Sir,
Your most obedient Servant,
T. P. Armitstead,
Executor Engineer Rutnagherry Collectorate.

P. S.—It first occurred to me that a few sketches or sections, illustrative of the cuttings, &c. of Phonda Ghaut, were necessary as accompaniments to this; but on second consideration I deem it advisable to allow the monsoon to pass by, or the work to be completed, before submitting them.

T. P. A.,
Executive Engineer.

No. 4108 of 1857.

Public Works Department.

Office of Chief Engineer of Public Works,
Bombay, 4th August 1857.

To the Right Honorable Lord Elphinstone, G.C.H.,
Governor and President in Council.

My Lord,—I have the honour to submit, with this letter, a report from the Executive Engineer of the Rutnagherry Collectorate, No. 165,

of 19th June 1857, on the progress of works under his superintendence during the year 1856-57, as called for in para. 5 of the Government Resolution under Mr. Secretary Hart's Memo. No. 1806, of 27th November 1855. This report was accompanied by a few lines from the Superintending Engineer Southern Province, stating that he had "no comments to note upon Mr. Armitstead's report, beyond expressing (his) satisfaction at the comprehensive way in which the subject is treated."

2. The only work of importance on which Mr. Armitstead has been engaged is the new line of road over the Phonda Ghaut, now considerably advanced, having been commenced two years ago. The road over the Ghaut is eight miles long, and the cutting was nearly completed on the 30th April. Seven and a quarter miles, it is stated, had been opened to a breadth of not less than 28 feet, with 32 feet width at the sharp salients; the remaining three-quarters of a mile has an average width of 22½ feet. The hill cutting has been sloped at various inclinations, according to the material, of ⅓, ½, and ¾ to 1—all of them, I should say, much too steep to stand, and Mr. Armitstead remarks in in his 4th paragraph—"I much fear, however, that there will be some serious land-slips."

3. In his 9th paragraph Mr. Armitstead admits that the work has not been expeditiously performed, but adds, that "it was carried out as quickly as the limited number of labourers admitted, which limited number was as great as an establishment (consisting of one Inspector and two Native Overseers), untaught and inexperienced, could with economy control. Sub-Assistant Surveyor and Builder Balajee Mahadeo has been employed on this work only about seven months; he wants practice."

4. Mr. Armitstead gives three tables—1, of the quantity and description of work executed; 2, of the rates at which that work was executed; and 3, of the actual cost of materials prepared for the work; all with reference to the Phonda Ghaut. Such tables, if carefully prepared, are of great use, and Mr. Armitstead deserves commendation for the labour and care which he has apparently bestowed in this instance.

5. In the 12th paragraph of his report, Mr. Armitstead describes the repairs made to the Dajeepoor Travellers' Bungalow. It will be recollected that this was purchased from Lieutenant Colonel (then Major) Phayre, and was reported to be in a very dilapidated condition in April 1856.

Letter from the Chief Engineer of Public Works No. 2730, of 10th April 1856.

6. By para. 13 it will be seen that five of the temporary bridges on the present road between Phonda and the top of the Ghaut have been thoroughly restored. Some trifling works had been executed at the Station of Rutnagherry (para. 14).

7. Mr. Armitstead concludes his report with a list of the surveys, plans, and estimates which he has prepared during the year. I am sorry to say that I have had repeated occasion to find fault with Mr. Armitstead's want of punctuality in furnishing his returns, but he seems to have been diligent in the preparation of surveys and projects.

I have the honour to be,
My Lord,
Your Lordship's most obedient Servant,
C. Waddington, Major General,
Chief Engineer of Public Works.

KOLAPOOR.

No. 321 of 1857.

Public Works Department.

To Lieutenant Colonel J. Kilner,
Superintending Engineer Southern Province, Sattara.

Sir,—I have the honour to forward you a concise report of the operations in this Territory during the year 1856-57.

2. As there were but few sanctions for the past official year, there is but little to say on works which have actually been executed. The Beejapoor and Kolapoor Road, suspended at the time that all works estimated to cost Rs. 20,000 and over were stopped, was commenced in December, and is now nearly completed. The line was fresh laid out, and somewhat shortened from the line first projected. As the old road passed in parts over low ground very much cut up with nullahs, the new line was selected so as in almost all cases to avoid broken ground, and to carry the road over a high as well as a smooth surface. There is one great complaint in the part of the country through which the road passes—the deficiency of water. It will probably be found necessary to sink some wells, and also to erect Dhurumsalas near the principal villages.

3. The Necessaries sanctioned for the Native Troops have been erected by contract, and have been handed over to the Troops. This is the first work that has been attempted by contract, and I experienced considerable difficulty in getting it satisfactorily executed.

4. The Wells have been carried on very successfully. No. 12, sunk fifty-four feet deep, had at the end of the season thirteen feet of water; it has been built up rectangular in shape. No. 13, which is the best well in Camp, is fifty-four feet deep, and had at the end of the season eight and a half feet of water. Working at it uninterruptedly day and night to see the strength of the spring, had no sensible effect in diminishing the height at which water stood

No. 14 was sunk to a great depth, seventy-one feet; and as No. 8, in the same line or valley, had not been successful, though forty-seven feet deep, and being dry before the end of the season, I feared that it would be a failure: however, at the end of the season, I made a bore in well No. 8, and the blasting appeared to have stopped just short of the spring. Well No. 14 will therefore be continued next season, and will, I hope, also prove successful. No. 5, sunk seventy-two feet deep, is pronounced a failure, and this also has been abandoned: it is a great depth, but appears not to be supplied by any spring. No. 7, for deepening which a sanction of Rs. 200 was accorded, has been deepened three feet, and appears to have reached the spring. I remarked that I had made a bore in No. 8: on seeing that a soft-water bearing stratum appeared close at hand, I applied for sanction to the Commanding Officer to deepen this well to the limit of the sanction in his power. The successful result will be noticed in the report for the year 1857-58. It will be seen that next year there will be for use wells Nos. 12 and 13, with plentiful supplies of water; as also No. 10, of which no notice has been made, as there has been no work done to it this season. No. 14 will probably be successful; as also No. 8, which appears to require very little to be done to make it also a good well. No. 7 well has been deepened three feet, and the spring tapped. There was a plentiful supply from this before the rains set in.

5. The operations this season have been chiefly confined to surveying. The Amba Ghaut has been surveyed, and a line found, to convey the road down into the Konkun, at a slope of 1 in 20: few lines present so very easy a section, and with such little rock-cutting. Taking advantage of an opening in the face of the Ghauts, and which can with ease be greatly cut down, the road will run for about four and a half miles along the face of the Ghauts at an uniform slope of 1 in 20, and then descend a spur, reaching the plains between the Chowkey at the foot of the Ghaut and the village of Sakape, in a length of three miles more.

6. For the Kajeerda Ghaut an estimate and plans will also be submitted. This Ghaut does not present so easy a feature as the

Amba: there is at the top a good deal of rock-cutting, but being nearly 500 feet less in height than the other, the cost of the work will, on the whole, be probably less.

7. Immediately on joining, I had to survey and send in estimates of the line from Dajeepoor to Nepanee. The season at which the survey was made was unfortunate, and the very limited time which it allowed me for preparation led to the rejection of the estimate. I would make two remarks on the rejection. The rates for the work were fixed from data at the time in the Office, chiefly taken from the Belgaum Office rates; and taking those as a standard, the work could not be done more cheaply. The estimate was also rejected as being at a high rate per mile. It was not taken into consideration that this road ascends and descends a Ghaut, the two being nearly seven miles in length; making a formidable addition to the cost of the road. Ten miles more, from Walewarah to Dajeepoor, are much intersected by drainage finding its way into the Bhagawuthee; and on this portion also occurs some rock-cutting. A revised estimate will be submitted shortly.

8. An estimate is also in course of preparation for making a first class road from Beejapoor to Dajeepoor, complete with bridges and drains; also for the portion in this Territory of the line of high-road from Belgaum to Sattara: for all these projects estimates will be sent in during the rains. A measurement has been made of all the roads existing in this Territory. The call for this measurement, which could in most Offices be responded to at once, has occasioned the loss to me of the services of my Surveyor. I have been very much cramped from the first Surveyor appointed being sick and unable to give any assistance, and as soon as a successor was appointed he had to be despatched to make measurements of all the roads in the Territory, amounting, with projected improvements, to nearly 500 miles, of which there were previously scarcely any measurements. I hope, when these roads are measured, to recommend that some of them be made at all events fair-weather roads: many of them are in a dreadful state, and scarcely passable for anything but bullocks or camels.

9. Regarding the agency required during the ensuing season.

There are very few works sanctioned in the Budget, and the present office establishment will suffice for the execution of projects during the year. I shall hope, before sanction is given for all these proposed roads and bridges, &c., that the establishment will be greatly increased, and with some experienced men. Not one of the present Surveyors could be entrusted to carry out any work, nor are there in the Kolapoor State any Maistrees who could be entertained as Overseers, without efficient supervision over them. But I am much in want of some experienced person to calculate or correct estimates, there being no person in this office competent to do this, and every estimate being framed and revised by the Executive Engineer himself.

I have the honour to be,
Sir,
Your most obedient Servant,
A. Davidson, Lieutenant,
Executive Engineer Kolapoor Territory.

Executive Engineer's Office,
Camp Kolapoor, 6th June 1857.

No. 1487.

Public Works Department.

Office of the Superintending Engineer S. P.,
Sattara, 12th June 1857.

To the Chief Engineer of Public Works, Bombay.

In transmitting this report, the Superintending Engineer Southern Provinces begs to state, he differs from Lieutenant Davidson as regards any heavy work at the Kajeerda Ghaut. Of all the Ghauts the Superintending Engineer has seen, it is the easiest; however, when the estimates are submitted the fact will be manifest.

J. Kilner, Lieutenant Colonel,
Superintending Engineer Southern Provinces.

No. 4762 of 1857.

PUBLIC WORKS DEPARTMENT.

Office of the Chief Engineer of Public Works,
Bombay, 4th September 1857.

To the Right Honorable LORD ELPHINSTONE, G.C.H.,
Governor and President in Council.

MY LORD,—I have the honour to submit a report, No. 321, of the 6th June 1857, from Lieutenant Davidson, Executive Engineer Kolapoor Territory, of his operations during the past official year, forwarded to me under endorsement 1487, of the 12th idem, from the Superintending Engineer Southern Province. This paper is submitted in compliance with the call in the Government Resolution under Mr. Secretary Hart's Memo. 1806, of 27th November 1855, para. 5. It was not accompanied by any Sketch of the country.

2. Lieutenant Davidson's operations have, with one exception, been confined to the Cantonment of Kolapoor. The exception is the clearance of a road from Kolapoor to Beejapoor, which was entered in last year's Budget for completion, but, according to this year's Budget, was not to be commenced till the 1st May, no superintendence being available. The entry to this effect was made on Lieutenant Davidson's own statement, dated 1st October 1856. It would appear, however, from para. 2 of his present report, that the road "was commenced in December, and is now nearly completed. The line was fresh laid out, and somewhat shortened from the line first proposed." This report again is not quite accurate. The precise condition of the work was described in the "Brief notice" submitted with my letter No. 3407, of 27th June, and a reference to that description will show that at the close of the official year the clearance was in reality little more than half finished.

3. In the Cantonment of Kolapoor necessaries for the Native troops were completed in 1856-57 by contract for Rs. 2,175. The sinking of wells, which has been a principal work hitherto in this new Camp,

is reported by Lieutenant Davidson to have been very successful. No. 12, sunk fifty-four feet deep, had at the end of the season thirteen feet of water. No. 13, also fifty-four feet deep, had eight and a half feet of water, which was not diminished by drawing it day and night. Well No. 8 had been sunk to forty-seven feet and stopped; but, the boring being resumed this season, a spring was found. For this reason No. 14 in the same line will be continued, though it had been sunk to a depth of seventy-one feet without water being found. By increasing the depth of well No. 7 only three feet, a spring has been tapped. One well only, No. 5, which has been sunk seventy-two feet without finding water, is considered by Lieutenant Davidson to be a failure, and is abandoned.

4. In his 5th paragraph Lieutenant Davidson observes that "the operations this season have been chiefly confined to Surveying." Of the Amba Ghaut, on the line to Rutnagherry, it is reported by him, that "few lines present so very easy a section and with such little rock-cutting." The Kajeerda Ghaut, on the line to Viziadroog, is not spoken of so favourably by Lieutenant Davidson (para. 6); but on this point Lieutenant Colonel Kilner observes that "he differs from Lieutenant Davidson as regards any heavy work on the Kajeerda Ghaut. Of all the Ghauts the Superintending Engineer has seen, it is the easiest."

5. In the 7th paragraph of his report Lieutenant Davidson enters on the subject of his survey of the line from Dajeepoor to Nepanee, and the high rates of his estimate, which was submitted to Government with my letter No. 9945, of the 5th December, but rejected on account of its excessive amount (letter from Mr. Secretary Hart, No. 3519, of 19th December 1856). Lieutenant Davidson explains, in a general manner, why the estimate for this road was so high, and he states that "a revised estimate will be submitted shortly."

6. Lieutenant Davidson states, in his 8th paragraph, that he is preparing an estimate for a first class road from Dajeepoor to Beejapoor, which would, I presume, include the beforementioned line from Dajeepoor to Nepanee; as also for that portion of the trunk road from Belgaum to Sattara which runs through the Kolapoor territory.

Lieutenant Davidson has, moreover, had the several lines of communication in that territory measured, to an extent of nearly 500 miles, as required by a call from this office. There is nothing more in Lieutenant Davidson's report which requires any notice from me.

I have the honour to be,
My Lord,
Your Lordship's most obedient Servant,
C. WADDINGTON, Major General,
Chief Engineer of Public Works.

SHOLAPOOR.

No. 574.

PUBLIC WORKS DEPARTMENT.

Executive Engineer's Office, S. C.,
Sholapoor, 12th June 1857.

To Lieutenant Colonel J. KILNER,
Superintending Engineer Southern Provinces, Sattara.

SIR,—I have the honour to forward a statement of the works completed and commenced during the official year ending 30th April 1856-57.

2. During the year under review three tanks for irrigational purposes have been completed in the Indee Talook of this Collectorate, and will, it is hoped, be brought into use this season. With an average fall of rain the tanks will contain water sufficient to irrigate from ten to twelve hundred acres. The largest of the three, at the village of Hutturgee, styled by the natives "Bungar Munie," has cost more than at first estimated, in consequence of there being more earth-work than allowed for; there will be also a corresponding increase in the depth of the tank, consequently a greater *area* for storage of water.

Tanks.

A tank and Bundara in the above Talook have been lately sanctioned, and will be commenced immediately, the cost of each will be about 18,000 Rupees.

Ramteerth.
Juggeevenee Bundara.

A small tank at the village of Keroor, in the same Talooka, erected about three years ago, was found to leak between the reservoir in rear and the toomb; this has been repaired, and the water in the tank will this season be used for irrigation.

In the Talooka of Barsee, a large tank, formed by a natural basin between the hills, will this season be brought to use; a bund and irrigating sluice being in course of erection.

Estimates and plans are in a forward state for making two more tanks; one in the Indee Talook, and the other more to the south, near the village of Shewngee, in the Hypurga Talooka.

Roads.

3. On the Poona and Sholapoor line a branch from the main road is nearly completed leading to the ferry on the Bheema, near the village of Raujnee. During the monsoon, and after heavy rain for several days, carts were detained after leaving the boat, being unable to reach the high road in consequence of having to pass through fields of deep black soil. The roadway has been paved for 300 feet near the river, and a raised moorum road, 1,300 feet in length, affords communication with the Sholapoor line. The estimated cost of this was about 1,200 Rupees.

Bridges.

At the village of Temboornee, on the same line, a bridge of one arch is having additional arches added, in consequence of its being found that in very high floods the water passes over the roadway.

About three miles further, a bridge of nineteen arches, fifteen feet span, at the village of Yenegaum, has been completed. The estimated amount has not been exceeded.

Estimates for two large bridges on this line, at the villages of Mohole and Sowleshwur, were transmitted last year for approval; the estimated cost of both amounted to Rs. 38,925.

Near Sholapoor a bridge was designed to cross the Balla Nulla. There being no foundation, it is proposed to erect the piers and abutments on wells, but the cost of the foundation alone being upwards of 33,000 Rupees, the estimate has not yet been forwarded. The Railway crosses this stream about one and a half miles below, and I understand some difficulty is found in making the foundation.

About half a mile from the town of Sholapoor one more stream remains unbridged. The banks are very low, and the flood extends a distance of 150 feet on either side; the foundation is bad, and, for want of height, a bridge would not, I think, answer the purpose.

A stone pavement over a 6-feet concrete foundation, with flood openings in the approaches, composed of piers, joined by slabstones,

would, I think, be preferable, and would prevent any detention of traffic in heavy rain.

Parapet Walls to Bridges.

Sanction has been received for adding parapets to all the drains and bridges on this line, and the work has commenced; many bridges being without any protection, and others with only stone pillars at intervals.

A line branching from the Poona and Sholapoor Road at Temboornee, in a north-east direction, to the town of Barsee, which was opened last year, has had several of the most difficult streams crossed by slab-drains; the largest of which has nine waterways, the piers and abutments being six feet in height.

The traffic on this line has been very heavy the last season, averaging 200 carts a day. The road being only of moorum, and newly made, has been severely injured, and it is doubtful whether moorum is sufficiently durable for a line on which there is so much traffic, which it may reasonably be expected will increase.

Roads.

The same may be said of the Poona line from the left bank of the Bheema to Sholapoor, a distance of 61 miles 2 furlongs 105 yards, which has been much cut up this last year, rendering it necessary nearly throughout the line to spread new material an average depth of six inches, besides having to remove the surface, which during the dry season was dust, now converted by the rain into mud. The traffic continues on the above lines throughout the monsoon.

Fair-weather Roads.

All the cross roads throughout the Collectorate have been repaired, as far as filling up ruts, removing bushes growing on the surface, and the side-gutters cleared.

Beejapoor Line.

Plans and estimates are in preparation for improving the line to Beejapoor by bridging all the smaller streams, and spreading moorum over the whole line. The number of drains and small bridges is considerable, being 198 in all, leaving about twenty-three large streams unbridged, in which are excluded the Seena and Bheema Rivers. The distance is 57 miles 2 furlongs 126$\frac{2}{3}$ yards.

A new line from Sholapoor towards Hyderabad, a distance of 14 miles 204⅓ yards, has been surveyed, and estimates and plans for bridges will be forwarded shortly for approval. The roadway will be raised about one foot, curbed and drained and covered with metal, width twenty-two feet in the clear. There are about eighty-five streams of different dimensions to be crossed with drains and culverts. A stream requiring seven 40-feet arches is not included in the above numbers.

Tandoolwaddee Line.

Between the two large towns of Barsee and Wyrag, in the Northern Talooka, an estimate has been forwarded to improve a distance of twelve miles, which had been cleared in 1855 by the Revenue authorities. The estimate amounts to Rs. 3,619.

Barsee Line.

On the Punderpoor line from Sholapoor, a distance of about seven and a half miles remaining to be cleared has been sanctioned, and the work is in progress.

Punderpoor Line.

In the Cantonment of Sholapoor, a road to connect the Camp with the Poona line, nearly half a mile in length, with two small bridges, has been completed. The work was performed by contract.

Several new lines are in course of being surveyed by Ensign Phelps, of the 11th Regiment N. I., appointed in February last as Probationary Assistant Executive Engineer in this Collectorate: he has completed about twenty-seven miles in the direction of Punderpoor, leading through Mohole to Wyrag.

New Lines.

4. In this Collectorate there are four ferries for which new boats have been sanctioned, one of which, on the Seena, at the village of Lambootee, has just been launched, but not quite ready for use. At the village of Teerah, likewise on the Seena River, a new landing-place has been erected, and the bank cut down, and the roadway paved with stone; the standards for the flying bridge have been renewed. The whole has cost Rs. 1,820-15-9, being a little in excess of the estimate in consequence. On removing the standards from the edge of the bank, which was unsafe, the feet of the posts were found too much decayed to refix, and new ones were substituted.

Ferries.

5. Two Dhurumsalas have this season been erected on both banks of the Seena, on the Poona and Sholapoor line, affording accommodation to travellers when unable to cross the river. The building is double-tiled, enclosed with a wall on three sides (the fourth side being open), with teakwood posts supporting the roof; the floor is well raised, and of moorum well beaten; and recesses and pegs are placed round the walls. The cost of the two buildings was 1,000 Rupees. The work was performed by contract.

Dhurumsalas.

At the Bheema River, on the Beejapoor line, at the village of Taklee, a similar set of buildings would be very beneficial, and afford shelter to travellers, who find it difficult to cross the river when at high flood. The amount for which the above were erected would not suffice at the present time, the Railway Department having engaged all the work-people in the Collectorate.

6. In the Cantonment of Sholapoor a new store-room for the Commissariat Department has been erected, the old one (originally an Hospital) having been found unsafe. The new erection is 90′ 10″ × 16′, with a veranda on two sides; the accommodation is divided into three rooms; the floors are of rough stone both inside as well as the verandas; the walls are fourteen feet high, of burnt brick and chunam masonry; the roof double-tiled, with matting under battens. The cost of the same was Rs. 3,872-6-5, which is slightly less than the estimated amount.

Military Buildings.

In the Arsenal a new office for the Deputy Commissary of Ordnance has been sanctioned, and the work about to be commenced.

Arsenal.

Estimates have been transmitted for sanction for the European Warrant Officers belonging to the Ordnance Department, four houses in all, with the necessary accommodation, amounting in the aggregate to Rs. 9,494.

7. In the Civil Lines an office and workshops have been sanctioned for the Executive Engineer of the Collectorate, and will be immediately commenced; the amount of the same is estimated to cost upwards of 5,000 Rupees.

Civil Buildings.

8. In conclusion, I would respectfully desire to bring to notice, that my superintending establishment consists of a European Supernumerary Assistant Overseer who joined the Department last year, and three Native Surveyors, one only of whom is qualified to be sent on any detached work, having only about a year ago left the Poona College. Without any recognised Maistree (those I employ, having shown skill in building, have been raised to the grade of Acting Maistree) my presence is required so often in different parts of the Collectorate, there is little time left to form new projects. My office establishment, consisting of one Accountant, one Writer, and two Assistants, one Head Karkoon, one Storekeeper, and one Assistant Karkoon, in all seven persons, have been retrenched their pay beginning from June 1855, for want of sanctioning authority.

9. I have only to add, the percentage of superintending establishment, as shown in the accompanying statement, is 22 per cent. This amount includes the pay of my Assistant, who is on special duty; without it, the charge would be only 18 per cent. on the total expenditure of the year.

I have the honour to be,

Sir,

Your most obedient Servant,

H. A. Adams, Captain,

Executive Engineer S. C.

STATEMENT *of Important Works under the Executive Engineer Sholapoor Collectorate, for* 1856-57.

Number.	District.	Names of Works.	Amount Expended in 1856-57.	Total Expenditure up to 30th April 1857.	Balance of Estimate or Probable remaining Cost.	Probable Time to Complete.	Remarks.
			Rs. a. p.	*Rs. a. p.*	*Rs. a. p.*		
		ROADS.					
1	SHOLAPOOR COLLECTORATE.	Connecting Poona and Sholapoor Road with Camp.	526 0 0	526 0 0	.....	Completed	By Contract.
1		Road between Soogthan and Beejapoor	1,662 15 0	5,181 5 3	.....	Do.	
1		Do. do. Sholapoor and Punderpoor	250 12 10	9,542 12 4	.....	Unfinished on the 30th April 1857.	
1		Do. leading to the Ferry at the Bheema River.	731 13 10	731 13 10	.....	Do.	
1		Do. do. from Sholapoor to the borders of Akulkote	293 11 1	630 8 6	599 0 11	Completed.	
1		Road from Temboornee to Barsee	6,177 10 8	34,081 11 6	14 4 6	Do.	
			9,642 15 5				
		BRIDGES.					
1		Constructing 12 additional Arches to the Bridge at Yenegaum.....	7,126 8 9	7,126 8 9	4 3 7	Completed.	
1		Adding increased Waterway to the Bridge at Temboornee	1,164 15 1	1,164 15 1	.....	Unfinished on the 30th April 1857.	
1		Constructing a Wall across the Bheema River..	175 8 8	476 5 10	.....	Completed.....	Excess Rs. 26-5-10
			8,467 0 6				
		PUBLIC BUILDINGS.					
1		Constructing a Shed for two Sick Carts in the Ordnance Department	365 10 8	365 10 8	4 5 4	Completed.	

Number.	District.	Names of Works.	Amount Expended in 1856-57.	Total Expenditure up to 30th April 1857.	Balance of Estimate or Probable remaining Cost.	Probable Time to Complete.	Remarks.
			Rs. a. p.	*Rs. a. p.*	*Rs. a. p.*		
1	Sholapoor Collectorate.	Constructing a Store-room for the Commissariat Department at Sholapoor.....	3,872 6 5	3,872 6 5	1 9 7	Completed.	
1		Constructing four Solitary Cells in the New Jail at Sholapoor	610 0 0	610 0 0	.....	Do.	
			4,848 1 1				
		Dhurumsalas.					
1		Constructing two Dhurumsalas on both banks of the Seena River at Lambootee in the Sholapoor Collectorate	1,000 0 0	1,000 0 0	.....	Completed	By Contract.
			1,000 0 0				
		Works of Irrigation.					
1		Constructing a Tank at Hutturgee	18,324 7 6	34,725 3 4	.....	Not completed.	
1		Do. do. Koodgee.....	4,232 15 6	8,232 15 6	.....	Do.	
1		Do. do. Inchgiree	7,726 2 1	12,429 1 8	.....	Do.	
1		Completing a Tank at Koragaum	864 1 8	864 1 8	.....	Unfinished on the 30th April 1857.	
			31,147 10 9				
		Ferries.					
1		Constructing a new Double Ferry Boat at Lambootee on the Seena River.....	1,100 0 0	1,100 0 0	.....	Do.	
1		Flying Bridge at Teerah	1,820 15 9	1,820 15 9	.....	Completed.	Excess Rs. 64-15-9
			2,920 15 9				

		WELL.								
1		Deepening and Building a surrounding Wall to a Well in the Cantonment of Sholapoor....	373	5	1	373	5	1	.....	Unfinished on the 30th April 1857.
			373	5	1					

			Amount.			Total.			Grand Total.		
		EXECUTIVE ENGINEER'S AND ASSISTANTS' SALARIES, AND ESTABLISHMENTS, &c.	*Rs.*	*a.*	*p.*	*Rs.*	*a.*	*p.*	*Rs.*	*a.*	*p.*
1		*Captain H. A. Adams, Executive Engineer Sholapoor Collectorate.*									
		Staff Salary, from May 1856 to April 1857....	5,400	0	0						
		Field Pay and Allowances, from do. to do.....	3,523	8	0						
		Travelling Allowance, from do. to do.....	1,820	0	0						
		Amount on account of having passed in the Language of the District, from 24th June 1855 to 30th April 1856.....	511	10	8						
						11,255	2	8			
1		*Captain W. R. Houghton, Assistant Ex. Engineer S. C.*									
		Staff Salary, from 1st May to 17th July 1856..	509	10	10						
		Field Pay and Allowances, from do. to do....	748	4	3						
		Travelling Allowance, for May 1856.....	145	0	0						
						1,402	15	1			
1		*Mr. J. S. Alexander, Sub-Assistant Ex. Engineer S. C.*									
		Staff Salary, from 14th April 1856 to 28th February 1857.....	2,825	15	10						
		Travelling Allowance, from do. to do.....	699	0	0						
						3,524	15	10			
		Carried over.. Rs.				16,183	1	7			

Left the Department on the 18th July 1856.

Left the Department on the 1st March 1857.

		Amount.			Total.			Grand Total.			
		Rs.	*a.*	*p.*	*Rs.*	*a.*	*p.*	*Rs.*	*a.*	*p.*	
	Brought over..	16,183	1	7							
1	*Ensign A. Phelps, Probationary Assistant Ex. Engineer S. C.*										Joined the Department on the 2d March 1857.
	Staff Salary, from 10th February to 30th April 1857 ..... 300 0 0										
	Field Pay and Allowances, from do. to do. 410 10 6										
	Travelling Allowance, from do. to do. 183 0 0										
		893	10	6							
	Superintending Establishment.				17,076	12	1				
1	Supernumerary Assistant Overseer Serjeant C. Campbell's Pay, &c., from 1st May 1856 to 30th April 1857	1,098	13	7							
1	Sub-Assistant Surveyor and Builder Dinker Ramchunder's Pay, &c., from May 1856 to April 1857.....	719	12	11							
1	2nd Class Sub-Assistant Surveyor and Builder Suckaram Narrain's Pay, &c., from May 1856 to April 1857.....	681	6	3							
1	2nd Class Do. Do. Suddasew Balcristn's Pay, &c., from May 1856 to April 1857.....	603	4	8							
1	Sub-Surveyor 1st Class Poorshotum Raghoonath's Pay, &c., from 13th March to 30th April 1857.....	90	0	1							
					3,193	5	6				
	Temporary Office Establishment.										
1	From May 1856 to April 1857				3,025	4	0				
	Travellers' Bungalow Establishment.										
1	From May 1856 to April 1857				384	0	0				
1	Petty Charges, from May 1856 to April 1857.....				953	7	10				
								24,632	13	5	

THE FOLLOWING IS A BRIEF ABSTRACT OF THE ABOVE :—

Roads	9,642	15	5			
Bridges	8,467	0	6			
Public Buildings	4,848	1	1			
Dhurumsalas	1,000	0	0			
Works of Irrigation	31,147	10	9			
Ferries	2,920	15	9			
Wells	373	5	1			
Emergent Works	6,592	6	8			
Ordinary Repairs to Buildings and Roads	19,715	3	4			
Petty Repairs	920	8	6			
Emergent Repairs	1,295	15	5			
Executive Engineer's and Assistants' Salaries, and Establishments, &c.	24,632	13	5			
				1,11,556	15	11
Per-centage of Staff Salaries, Establishments, &c. &c. on Gross Expenditure				22	1	3

H. A. ADAMS, Captain,
Executive Engineer Sholapoor Collectorate.

Executive Engineer's Office S. C.,
Sholapoor, 1st May 1857.

No. 1553 of 1857.

PUBLIC WORKS DEPARTMENT.

Office of the Superintending Engineer S. P.,
Sattara, 17th June 1857.

To the CHIEF ENGINEER OF PUBLIC WORKS.

Transmitted by the undersigned.

J. KILNER, Lieutenant Colonel,
Superintending Engineer S. P.

No. 4859 of 1857.

PUBLIC WORKS DEPARTMENT.

Office of the Chief Engineer of Public Works,
Bombay, 10th September 1857.

I submit the foregoing for the information of His Lordship in Council, with reference to the Government Resolution under Mr. Secretary Hart's Memorandum No. 1806, of 27th November 1855. Lieutenant Colonel Kilner has not made any remarks on Captain Adams's report, nor is the report accompanied by a Sketch of the country as directed.

2. Captain Adams's letter does not furnish a continuous and full account of all the works executed in his Collectorate during the past year, and conveys an impression that not much has been done. The accompanying statement, however, supplies the deficiencies, and shows that a fair proportion of work has been executed. In many points the information given by Captain Adams's report and statement, taken together, is more complete than that furnished by other Executive Officers, and Captain Adams's remarks are judicious as to improvements required and his recommendations as to what should be done.

3. A considerable sum has been spent on four irrigation tanks during the year 1856-57 (Rs. 31,148), of which three, at Hutturgee, at Koodgee, and at Inchgiree, are completed and sufficiently capacious to water from 1,000 to 1,200 acres (para. 2).

Nos. 180, 181, 182, Statement 2 of Budget for 1856-57.

4. A branch from the Sholapoor and Poona Road to the Bheema Ferry near Raujnee (1,300 feet of raised moorum road and 300 feet of paved road) have been nearly finished over black soil, otherwise impassable after heavy rain (para. 3). Additional arches to the Temboornee one-arched bridge are in progress, and twelve additional arches to the Yenegaum Bridge are finished, both of these being on the Sholapoor and Poona Road. A connecting road, nearly half a mile long, from the above road to the Cantonment of Sholapoor, with two culverts, is completed. From Captain Adams's report it appears that four considerable streams still remain to be bridged on the Sholapoor and Poona Road at the Sholapoor end, viz. two near the villages of Mohole and Sowleshwur (an estimate for the former was submitted with my letter No. 12171, of the 30th November 1855, but was not sanctioned;* the estimate for the latter has not been forwarded to me by the Superintending Engineer); one over the Balla Nulla, of which the bed is so treacherous that the foundations alone are estimated to cost Rs. 33,000; and one about half a mile distant from the town of Sholapoor, which is so wide and shallow, that Captain Adams proposes in preference a paved causeway on concrete foundation with flood openings in the approaches slabbed over. All these streams are difficult for carts on account of the beds being unsound. So great is the traffic on this road, that Captain Adams reports his having found it necessary to lay on six inches of moorum nearly throughout that part of the line which is under his superintendence from Sholapoor to the Bheema, 61m. 2f. 105y., and he describes the traffic as continuing throughout the monsoon. This confirms the opinion which I have always held, that if a road be metalled and bridged, even though imperfectly, it will tend to change

No. 6, Statement 2 of Budget for 1856-57.

Estimate Rs. 15,292.

* Government Resolution under No. 1909, of the 14th December 1855.

the nature of the communication, extending it from the fair season to the whole year, and creating a class of carriers who will keep up cattle for that purpose only, which can hardly be done when roads are mere clearances passable during seven or eight months only of the year. Captain Adams is of opinion that where there is so heavy a traffic as on this road, the surface should be metalled with broken stone.

5. The branch road from Temboornee to Barsee, 35m. 7f. 192y., which was opened last year, has had many of its streams crossed by slabbed waterways (large slabs are readily procurable in that part of the country). The traffic is stated by Captain Adams to have averaged 200 carts a day, and the road has been so much cut up, that Captain Adams doubts whether a moorum road be adapted to heavy traffic like this. In such cases metalling becomes necessary, and will, I believe, be found the most economical, notwithstanding the first heavy cost.

No. 52, Statement 2 of Budget for 1856-57.

6. Plans and estimates it appears have been prepared for improving the line from Sholapoor to Beejapoor, a distance of 57m. 2f. 127y., by bridging the smaller streams and by a coating of moorum; and a distance of 14m. 204y. of a new line from Sholapoor towards Hyderabad has been surveyed, and plans and estimates are in preparation for making that part of the road. An estimate (Rs. 3,619) for improving twelve miles of the line between Barsee and Wyrag has been submitted.* A clearance of seven and a half miles on the line from Sholapoor to Punderpoor, which remained undone, has been sanctioned† and commenced. Ensign Phelps is reported to have completed his survey of twenty-seven miles in the direction of Punderpoor leading through Mohole to Wyrag.

7. Of the four new boats sanctioned by me for ferries in the Sholapoor Collectorate, one, at Lambootee, on the Seena, is stated to have been launched (para. 4). At Teerah, on the Seena, a new landing-place has been made, the bank cut down, the roadway paved, and the standards of the flying bridge renewed. On either bank of the Seena,

* Letter No. 1433, of 14th March 1857.

† Government Resolution No. 1053, of 17th —— 1857. For original work see No. 56, Statement 2 of Budget for 1855-56.

where crossed by the Sholapoor and Poona Road, durable Dhurumsalas have been built (para. 5). Captain Adams recommends similar Dhurumsalas at Taklee, on the Bheema, observing, however, that they could not be built for the same sum, "the Railway Department having engaged all the work-people in the Collectorate." Under existing difficulties, however, no new works can be undertaken, and it is fruitless to speculate on future operations, which may be long deferred.

8. In the Cantonment of Sholapoor a Commissariat store-room has been built of durable materials. Estimates for quarters to accommodate the Warrant Officers of the Ordnance Department have been submitted, and an office for the Deputy Commissary of Ordnance is sanctioned.

No. 29 in Statement 2 of Budget for 1857-58.

9. In the Civil Lines an office, store-room, and workshop for the Executive Engineer were sanctioned (para. 7), but the work will not now be prosecuted. The work has been erroneously entered in the Budget under the head "Military." It should have been under the head "Public, General."

No. 28 in Statement 2 of Budget for 1857-58.

10. Captain Adams, in his 8th paragraph, represents the smallness of his subordinate superintending establishment, consisting of one European Assistant Overseer, one Sub-Assistant Surveyor, and two Sub-Assistant Surveyors of the second class. I am not aware that he has before the present occasion noticed this subject, or applied for an increase: it will not now be required. With respect to the office establishment which has been kept up at Sholapoor from the beginning of June 1855, the circumstances under which this was done were represented in my Memo. No. 3739, of 16th July 1857, and the admission of their salaries was authorised by the Government Resolution under Mr. Secretary Hart's Memo. No. 2226, of the 3rd August.

C. Waddington, Major General,
Chief Engineer of Public Works.

SATTARA.

No. 761 of 1857.

Public Works Department.

To the Superintending Engineer Southern Province,

Sattara.

Sir,—I have the honour to forward my annual report of proceedings in this Collectorate for the official year 1856-57, arranged under the three following headings:—

Actual operations.
Projected works and requirements.
Agency.

Actual Operations.

No. 4. *Statement No.* 1, *Budget for the year* 1856-57. "*Bridged and Metalled Road from Chiploon to Kurar, over the Koombarlee Ghaut,*" *sanctioned for Rs.* 6,52,916. *Authorised Expenditure for the year, Rs.* 2,50,000.

2. I may here remark that there is an error in the description of this work given in the Budget. Metalling is not provided for in the sanction, except upon the Ghaut portion of the line. The original project included, it is true, metal throughout, but this item was, from motives of economy, omitted for the whole road, with the exception of the Ghaut, when the estimate was revised.

3. Before proceeding to detail what has been done during the year that has just closed, I must explain that the work has, for convenience sake, been considered to consist of the undermentioned Divisions (vide Sketch of line following):—

No. 1 Division. $20\frac{1}{4}$ miles in length, from Kurar to Patun. The Patun Bridge over the River Kera, 3 spans of 60 feet each.

No. 2 Division. $13\frac{1}{2}$ miles in length, from Patun to Helwak. The Helwak Bridge over the River Quoina, 5 spans of 60 feet each.

No. 3 Division. $3\frac{1}{2}$ miles in length, from Helwak to foot of Ghaut.

No. 4 or Ghaut Division. 9 miles 3 furlongs in length.

4. The state of the work, on the close of the season 1855-56, was as follows:—

On No. 1 Division the road had been brought up to formation level throughout; a small portion of the moorum surface layer had been put on; and the bridges and drains, 128 in number, were most of them completed or in an advanced state of progress.

The Patun Bridge had been completed up to springing level.

No. 2 Division had throughout been nearly brought to formation level.

The Helwak Bridge and No. 3 Division had not been taken in hand.

The Ghaut Division had been opened out to various widths, to a length of about 5 miles.

5. During the year which has just closed, the following has been effected:—

6. The moorum surface on No. 1 Division has been completed, with the exception of about $1\frac{1}{4}$ miles near Kurar, which I have not thought it prudent to complete until the question as to the sanction of the bridge over the Quoina at that place is decided.

7. The bridging and draining works on No. 1 Division have also all been finished, with the exception of one or two small drains near Kurar, which I have not yet taken in hand, for the reason just adduced for not completing the moorum surface on this particular part of the line, and of two bridges which could not, owing to the difficulties offered by wet foundation, be commenced till late in the season: these two bridges were, however, on the 30th ultimo, in a very advanced state, and will be completed up to roadway level before the setting in of the rains.

8. On the Patun Bridge the western arch has been turned and backed, and the centre on which it was built eased and removed. The middle arch has also been turned and backed, and its centre eased and completely released. The eastern arch, on the 30th ultimo, was completed to within two courses on either side of the key-stone.

9. To give a better idea of the state of this work, I attach a Photographic picture of it, taken on the 1st instant, which will show at a glance its progress on the close of the official year.

10. It will be noticed that the eastern arch is supported on a centre of a ruder description than that provided for the adjoining one; the cause of this is, that I was, owing to various circumstances, unable to procure, sufficiently early in the season, enough jungle timber to enable me to construct, as I wished to have done, a better kind of support. The centre, however, used was so arranged as to admit of slacking by means of wedges, and it has answered its purpose very well; for, subsequent to the date on which the annexed picture was taken, the arch was keyed and the centre eased.

11. This bridge may now, with the exception of the spandril walls and upper works, be said to be completed, and all the critical points in its construction have been safely passed.

12. On No. 2 Division the whole length has been brought to a final formation level, clear above the floods of the River Quoina, along whose bank it, for the greater part of its length, passes. On it also, all the bridging and drainage works, 76 in number, have been in active progress, and are in such a state of forwardness, that before the setting in of the monsoon they will be uniformly up to roadway level. Some of these works on this part of the line are extremely heavy, the spans ranging up to 40 feet, and the height to roadway to 31 feet.

13. The Helwak Bridge foundations have been got in through sand and running water, and placed securely upon rock, and the bridge raised to springing level, with the exception of two of the piers, which are however in a very forward state, and will attain the same height before the works are closed for the season.

14. This bridge of 5 spans of 60 feet each is a very heavy work, the springing line of the arches being 28 feet above the bed of the river, and the height of the roadway above the same point being 53 feet. On it, all that would be proper or prudent to do this year, has been done.

15. No. 3 Division has been brought to formation level and embanked throughout.

SKETCH PLAN,

Showing state of the Koombharli Ghaut line of road on the 30th April 1857.

Division No. 4.
Ghaut Division all cut to formation except 1½ miles which metalling is nearly complete & partly retained and Drained.
Division No. 3.
Division No. 3 banked to formation Level.
Division No. 2.
Division No. 2 Banked to formation, ¾ Moorrumed, Bridges and Draining works all in an advanced state
Division No. 1.
Division No. 1 Banked to formation Level, Moorrumed, Bridged and Drained except 11 miles between Moondwah and Kurrar.
Pepilee
Bamnoli
Marool
Sirool
Patun
Adulpal
Mathaiwadi
Vikol
Cherry Farm
Khind
Sakordi
Moondwah
KURRAR
No. of Bridges 22.
No. of Drains 64.
No. of Bridges 21.
No. of Drains 107.

Executive Engineer's Office,
Camp Wace, 25th May 1857.

(Signed) M. K. Kennedy,
Captain, Executive Engineer,
Sattara Collectorate.

B.E.S. Press.

16. On the Ghaut all the cuttings, both in rock and earth, have been taken out to full width, except on a distance of about 1½ miles in rock excavation, where the breadth is still a very little short of the formation required. Nearly all the retaining walls, which on the upper part of the line are very heavy, have been finished, and twenty drains were completed and three in progress at the close of the year.

17. To summarise. The length of the whole line, from Kurar to the foot of the Ghaut in the Concan, is 46¾ miles, of which the whole, with the exception of a short portion on the Ghaut, has been taken out to full breadth. Bridges and drains between Kurar and Helwak, a distance of 33¾ miles, are either finished, or in such a state of advancement, that this extent of the line will be passable for cart traffic the first thing after the approaching monsoon; and the whole work from end to end has made such progress, that I can venture to engage to have it all ready to open to the public before the close of the official year on which we are now entering, with the exception perhaps of the Helwak Bridge upper works, and a little kerbing, or construction of parapets, here and there.

18. I attach a Sketch of the line, showing at a glance its state on the 1st instant.

19. The expenditure on this road has fallen short of the sum authorised by Rs. 39,656, but I do not feel that I have failed in any way. Rupees 2,10,344 is a large sum to profitably expend in less than eight working months with a young establishment; and I did not feel disposed to push the works forward faster than I considered was advantageous, merely for the purpose of getting rid of a certain amount. I have experienced, moreover, some considerable difficulty in the matter of skilled labour (my principal want on the work during the season), the cause of which I will notice further on in this report when speaking of Agency.

20. At the commencement of the season Lieutenant Duncan was in charge of No. 1 Division of the line and the Patun Bridge, but was removed for field service in Persia before much was done.

21. Mr. Hart, C. E., was at first in charge only of Nos. 2, 3, and 4

Divisions and the Helwak Bridge, but on the removal of Lieutenant Duncan the superintendence of the whole line devolved upon him; Mr. Jacob, C. E., who was sent to supply Lieutenant Duncan's place, and who had no knowledge of the language, or the mode of carrying on works in this country, being placed under Mr. Hart's orders.

22. I am highly satisfied with the manner in which Mr. Hart has conducted the heavy duties which have fallen to him, and with the zeal and ability with which he has afforded me assistance.

23. Mr. Supervisor Stapleton and the Non-Commissioned Officers as per margin, who have been employed on the line, have also, except in two or three trifling instances, worked very well, and have been very steady. All have in fact behaved in such a satisfactory manner, that I am unwilling to particularise individuals. I may, however, observe, that I shall in all probability soon bring Mr. Stapleton's name forward for promotion, and that Serjeant Assistant Overseer Wallinger, on whom the charge of the heaviest work of construction on the line, the Helwak Bridge, devolved, has displayed considerable aptitude for supervision, has taken great interest in his duties, and has done some very good and cheap work.

Serjeant	Assistant Overseer	O'Connell.
Do.	Do.	Ferrell.
Do.	Do.	Wallinger.
Do.	Do.	Devine.
Do.	Do.	Cooney.
Do.	Do.	Matthews.

24. In concluding this portion of my report, I cannot refrain from congratulating Government on the benefits to this part of the country that are likely to result, on the completion, at a now no distant period, of this important work. The traffic, by pack bullocks, along the line, is at the present moment very great, and when it is further developed, as it undoubtedly will be, on the opening of the road for carts, it must, I think, become enormous.

25. You may remember, when visiting Helwak early in the present month, our attention being directed to the numerous Brinjaree encampments which extended all around as far as the eye could reach, and that we estimated the number of pack animals then encamped, which might be taken as the present measure of the daily traffic, at not less than from 1,500 to 2,000.

No. 5. *Statement No.* 1, *Budget for the year* 1856-57. "*Cleared Road from Waee to Sheerwul viâ the Kamathee Ghaut.*" *Sanctioned for Rs.* 45,231; *the whole to be expended within the year.*

26. This work consists of twenty miles of cleared road, and an intermediate portion of Ghaut, over the range dividing the valleys of the Neera and Kristna Rivers; the latter to be constructed permanently for cart traffic. The portion lying to the north of the Ghaut, and the Ghaut itself, forms part of the proposed new direct north and south line from Poona to Sattara and the Southern Muratha Country; and the portion south of the Ghaut is a local improvement for the benefit of the large town of Waee.

27. The original intention was that this road should be commenced and finished in one working season; but the operation of the order from the Supreme Government, communicated with the Assistant to the Chief Engineer of Public Works' Circular Memo. No. 4113, of the 26th May 1856, which stopped the commencement of all works estimated to cost upwards of Rs. 10,000, and which was not rescinded until November, prevented its being taken in hand till late in the season.

28. When permission was at length accorded to proceed with the work, a reference was made by the Chief Engineer of Public Works, to know what the probable expenditure on it would be in the year 1856-57, and Rs. 10,000 was named as the sum likely to be required.

29. Owing, however, to want of superintendence, the actual commencement of the work was delayed till the beginning of February, and since then operations have been entirely confined to the Ghaut itself, the road portions having been left for next year.

30. The Ghaut portion of the line is two miles and five furlongs in length, and the cuttings required are not only in very steep cross sections, but also in nearly uniform hard material throughout. Up to the 30th ultimo, a length of close upon two miles had been opened out to breadths varying from eighteen to four feet, of which more than one mile is of the former width, and before the setting in of

the monsoon I hope to have nearly all the heavy rock-cutting finished, and the whole line completed to a breadth of from twelve to eighteen feet.

31. This is all I consider it necessary or advantageous to do this year, for most of the excavations which are not in rock are in very hard moorum, too solid to yield readily to the pick or crow-bar, and not hard enough for the mining-bar; and I expect to derive considerable advantage, and to lower the cost of the remaining work, by awaiting the softening influence of four months' exposure to rain and moisture on this tough material.

32. I have also arranged to encourage the fall of slips during the monsoon in the incomplete cuttings, which, if they occur, will, I hope, save considerable expense in excavating the material.

33. Lieutenant Sellon has had charge of this work, and I have had every reason to be satisfied with the progress that has been made, and with the assistance he has afforded me.

34. The expenditure has fallen short of the expected amount by Rs. 2,828. The principal cause of this is, that as the work was commenced shortly before the Hoolee festival, some difficulty was at first experienced in getting together a sufficient quantity of labour.

No. 6 *of Statement No.* 1 *of Budget for* 1856-57. "*Masonry Bridge over the Quoina River at Kurar.*"

35. This work is still suspended awaiting orders from the Honorable the Court of Directors regarding the revised estimate.

No. 5 *of Statement No.* 2 *of Budget for* 1856-57. "*Cart Road over the Wurrundur Ghaut.*" *Sanctioned for Rs.* 85,298. *Amount for expenditure during the year, Rs.* 45,298.

36. On the close of the official year 1855-56, during which this Ghaut was commenced, its state was as follows: of the total length of 10 miles 7 furlongs and 126⅓ yards, 6¾ miles had been opened out to various widths, of which 4¾ miles were to the full breadth, kerbed, moorumed, and partially drained.

37. The operations of the year which has just closed have very nearly completed the portion which remained over from last season's work. The whole Ghaut is now opened out to full width, with the exception of a very small portion here and there in the rock-cuttings. The retaining walls, which are extremely heavy along that part of the line which has been in hand this season, have been nearly finished; and 58 drains and 15 stone dips have been in progress, and were all on the point of completion on the 30th ultimo.

38. This road will be open for cart traffic the first thing after the rains, and is now used by large numbers of laden bullocks, carrying goods to and from the port of Mahar.

39. About the middle of the season I had occasion to bring to the notice of Government that parapets, which are absolutely essential on this line, had been omitted in the estimate on which sanction was accorded, and on my representation their construction at an estimated cost of Rs. 3,300 was authorised as an emergency for 1856-57.

40. Owing, however, to a falling away of labour, I have only been able to execute a very small portion of the work in these parapets during the year which has just closed, and have consequently been obliged to solicit sanction for the unexpended balance as an emergency for 1857-58.

41. The expenditure on this work has been in accordance with the sanction for the year.

42. At the commencement of the season this Ghaut was entrusted to the superintendence of Captain Houghton, Assistant Executive Engineer, and on the removal of that Officer, shortly after the works were begun, I placed it under the charge of Mr. Brock, Surveyor and Builder, who had attained some experience under the late Lieutenant Chapman, on the Thull Ghaut, in works of this description. Mr. Brock, assisted by Serjeant Assistant Overseer Wholohan, has carried on the Ghaut ever since, and, generally speaking, has done so to my satisfaction. I was, however, put to the greatest inconvenience by Mr. Brock's compulsory absence for six weeks in Bombay, during the very height of the working season, to give evidence in a certain suit which came before the Supreme Court.

43. This absence, together with other causes connected with the supply of labour, has prevented my having (as I at one time fully expected to have) the whole line opened and ready for cart traffic by the 30th ultimo.

44. Serjeant Wholohan, on whom for some time devolved the whole superintendence of this heavy work, has behaved very well, and by his steady and careful conduct has given me considerable satisfaction.

No. 23 *of Statement No.* 2 *of Budget for* 1856-57. "*Opening a new Road from Kunneegaum on the Warna to Kurar.*" *Sanctioned for Rs.* 6,683, *and for completion within the year.*

45. This road, which forms part of the north and south trunk line, is 30 miles 1 furlong in length, and is nearly all over deep black soil. It has been completed within the season, at a cost of Rs. 6,243-14-2.

46. This work has been superintended by Mr. Whittenbury, Assistant Executive Engineer, and has been done satisfactorily.

47. It is fortunate, however, that projects for bridging and draining and mooruming the line have gone in, and will probably be sanctioned for execution in the present year's Budget, for, owing to the nature of the country passed over, viz. a level, deep, black soil plain, a simply cleared line, executed at a cost of only Rs. 200 per mile, cannot be expected to be very permanent.

48. A road constructed under such conditions cannot fail to become almost immediately obliterated, from the filling up of the side-channels by the washings from the fields during heavy rains; and, in my opinion, cleared lines in such situations should not be undertaken except as rudiments of a more permanent road, and in cases where bridges, drains, and embanking are immediately to follow.

49. In the case of the road under reference, I have embanked the line as far as my means would permit, and have provided for the nullah-crossings in the most economical manner possible, under the impression that these temporary expedients will now very shortly be superseded by the construction of regular bridging and drainage works.

No. 49 *of Statement No.* 2 *of Budget for* 1856-57. "*Secondary Line of Road from the Nahavee Ghaut to Tasgaon.*" *Sanctioned for execution by the Collector for Rs.* 10,000, *and for completion in one Season.*

50. A distance of 30 miles 1½ furlongs of this line lies within the boundary of this Collectorate, and at the Collector's request I undertook to relieve him of its construction, a sum of Rs. 7,631-9-3 being placed at my disposal for that purpose.

51. The whole distance has been cleared in a very substantial manner, the mileage rate of Rs. 252-12-0 permitting me to do more than can be ordinarily effected by the usual rate for such roads.

52. As therefore it may probably be a very long time before bridges and drains will be built on this line, I have paid particular attention to the nullah-crossings, and have provided them, when in soft soil, with paved, moorumed, or sanded dips, according to local circumstances.

53. I hoped also to have been able, in a few particular instances, to have constructed rough drains; but the Superintending Officer having misunderstood, or neglected to attend to certain orders given him on this subject, I was deprived of the opportunity of doing what I at first hoped to have effected in this way.

54. The cost of this work has been Rs. 7,608, showing a saving, on the sanctioned amount, of Rs. 23.

55. The road has been superintended by Mr. Whittenbury, Assistant Executive Engineer, and has been carried out in a satisfactory manner, with the exception adverted to in the 53rd paragraph.

No. 50 *of Statement No.* 2 *of Budget for* 1856-57. "*Making a portion of the Pussurnee Khind Road.*" *Sanction for Rs.* 2,706, *and for completion within the year.*

56. This work consisted in opening out about one mile of the bullock track at the top of the Ghaut, which portion was omitted from the original estimate; connecting the bottom of the Ghaut with the town of Waee, and its top with the existing cleared road from the Tye Ghaut to Mahableshwur.

57. These two portions of road above and below the Ghaut have an aggregate length of about 4½ miles, and, together with the upper portion of the Ghaut itself, have been finished at a cost of Rs. 2,468.

58. This work was principally superintended by Serjeant Overseer Malligan, and it has been fairly done.

59. A toll was put on the road about the beginning of April, and, judging from the numbers of pack animals and passengers I have seen upon it, I have no doubt it will yield a good return.

60. The above are all the works included in the Budget for the year, but in addition to them several others have been performed on emergent sanction.

61. A sum of Rs. 3,080, being the amount of a supplementary estimate submitted by me, for constructing that part of the Loonud Road between the town of Bhore and the Neera River near Hurosee, has been expended on this work, the head of which had advanced to within two miles of its junction with the existing cleared road in connection with the Wurrundur Ghaut, on the termination of the official year.

62. Besides this sum, a further amount of Rs. 1,670 has also been spent on this work, in my endeavour to complete and open it within the present season. For this excess I have requested sanction as an emergency for 1856-57, and the proposed expenditure, included in the Budget for 1857-58 for this road, will of course be reduced by a like amount.

63. The part of the line which has been in hand this year has been over very difficult country, and I shall not be able to complete it at all before the setting in of the rains; I will, however, have it open the first thing after the monsoon, and thus clear the whole communication for carts from Sholapoor, Punderpoor, &c., *vid* the Wurrundur Ghaut to the port of Mahar.

64. Parapet walls have been built at a cost of Rs. 493 on the most dangerous portions of the Mahableshwur Ghaut to Parr. The estimate submitted by me for this work, which was sanctioned as an emergency of 1856-57, provided for nearly double the amount of walling that has been done, at a probable cost of Rs. 886; but, as

what has been effected will afford protection to the traffic at all the points where it is most needed, and as the present wretched road is soon likely to be superseded by a new Ghaut, I do not think it would be expedient or necessary to incur any further expense on these parapets, at all events pending the settlement of the question regarding the new road between Mahableshwur and the Concan; and I have accordingly made a proposal to that effect in a separate communication.

65. A cook-room has been built at the Travellers' Bungalow at Akeet, at a cost of Rs. 150, being a saving on the estimated amount of Rs. 28. This work was sanctioned as an emergency for 1856-57.

66. Repairs to the Bund of the Yuma Lake at Mahableshwur, sanctioned as an emergency of 1856-57, have been and still are in progress. Sanction to the unexpended balance which remained on the 30th ultimo has been solicited as an emergency of 1857-58.

Projected Works.

67. For works of communication the following projects have been submitted, and included in the Budget of 1857-58 :—

Embanking and mooruming road between Sattara and the Warna River	Rs. 52,600
Bridging and draining road, with the exception of seven large streams	52,514
Clearing line of road between Loonud and Punderpoor *vid* Phultun.....	20,350

68. The two first have reference to the same line of road, and are parts of one and the same work, which, when sanctioned and executed, will constitute a most important improvement. The traffic along this line, which forms part of the main communication between Poona and the Southern Collectorates, is very great, and is visibly daily increasing.

69. Where two years ago such a thing as a cart was never to be seen, strings of vehicles may now be met with traversing the fair-weather road already cleared. I have myself in a short morning's march seen upwards of fifty carts, and calculate that the traffic has already reached from 100 to 150 carts per diem.

70. When bridges, drains, and moorum have been added, I do

not doubt that this road will draw to itself all the traffic which passes along adjoining cleared lines and native tracks, and that it will greatly develope trade and industry in the districts through which it passes.

71. I have reason to believe that empty carts already ply along the road for hire, and that the inhabitants of the villages on and near it avail themselves of these opportunities to send their produce to distant markets; and I trust, therefore, that we have heard the last of grain being abundant and going to waste in the rich Walwa districts south of Kurar, while selling at almost famine prices in Sattara.

72. To make, however, this line fully efficient, bridges over the seven main streams, designs for which are not included in the project already submitted, must be provided for. The plans and estimates for these necessary works I hope to send in during the coming monsoon.

73. The Loonud and Punderpoor line will be most useful as completing in these districts the main east and west line *viâ* the Wurrundur Ghaut to the Coast.

74. The great want of the Sattara district now, on the completion of the works already sanctioned, is a direct communication with the sea from Sattara itself and the central Talookas; and having received instructions to submit a project for supplying this want by a road to the port of Khier *viâ* the Ambolee Ghaut, I transmitted plans and estimates for such a line in September last.

75. At the same time, however, I thought it was my duty to bring to notice my conviction, that the requirement in question, as well as several important collateral advantages, might be better and more cheaply provided for by substituting a road from Sattara *viâ* Malcolm Peth to Mahar, for one by the Ambolee Ghaut to Khier.

76. The reasons I adduced for the change of plan were very briefly these:—

The Mahableshwur line being already partly done, would involve a less expenditure. It would lead the traffic to a good port, instead of to a very indifferent one.

It is nearly as direct and quite as convenient, and while providing for the Sattara traffic fully, would, at the same time, constitute a most vital improvement to the principal Sanitarium of the Presidency,

giving to that place what it now so much requires, a direct communication, practicable for wheeled vehicles, with Mahar and Nagotna.

77. On the representation thus made, the Ambolee project has been held in abeyance, pending the preparation of plans and estimates for the Mahableshwur line, so that a comparative judgment of the merits of both schemes may be safely arrived at.

78. The necessary survey for this project has been in progress during the past season, and is nearly completed. The results it has given have been, as far as I can at present judge, very favorable, and I hope to be able to make the voluminous calculations necessary for the perfection of the project, and to prepare the necessary plans and estimate for the line, in time for submission with the next Budget.

79. In connection with this road a report was called for and submitted, early in the season, for a direct line from Waee to Mahar; but, while stating that such a line was perfectly feasible *viâ* the head of the Kristna valley, I brought to notice that if the direct Sattara route to Mahar *viâ* Mahableshwur should be approved of in preference to that *viâ* Ambolee to Khier, in that case the Waee traffic might better be provided for by a branch *viâ* the Pussurnee Khind (already half done) to join the Mahableshwur Ghaut near Malcolm Peth; and that only in the event of the Ambolee line being selected, would it be necessary to construct an expensive line and Ghaut as especial outlet for the Waee valley.

80. I have every hope that Government will eventually decide to sanction the Mahableshwur line and Pussurnee branch, in preference to two distinct lines and Ghauts at Ambolee and the head of the Kristna valley. The former scheme, in addition to its intrinsic merits, possesses the advantages of providing, in connection with the north line *viâ* the Kamatkee Ghaut, already sanctioned and in progress, a direct cart communication between Poona and Mahableshwur, which is very much needed.

81. An estimate for widening out the Kailghur Ghaut, between Sattara and Mahableshwur, to a full width of twenty-four feet, was also submitted by me, but has been laid aside pending the settlement of the question of the direct road between Sattara and the Coast. The

necessity, however, of rendering this Pass, under any circumstances, practicable for carts, having been recognised, I have been permitted to submit an estimate, amounting to Rs. 9,362, for opening it out to sixteen feet clear width, which is included in the Budget for 1857-58.

82. I have now in hand, and hope to be able to submit during the coming monsoon, a project for mooruming, embanking, and draining that portion of the direct road between Poona and the south, *viâ* the Kamatkee Ghaut, which lies between Sattara and Sheerwul on the river Neera.

83. The construction of this line, in supersession of the circuitous route *viâ* the old Neera Bridge, is, I believe, under the consideration of Government; and the project I now refer to will provide for the completion of this great line within the boundaries of this Collectorate.

84. The above are all the projects I have brought forward, or hope to bring forward, in connection with communications for this and next year's operations; but I shall lose no opportunity of procuring data to enable me by degrees to provide for the progressive improvement of all the main lines passing through my charge. Pressure of actual work, and want of assistance, however, will render this a work of time.

85. The whole time of the Department in this Collectorate being so fully occupied with road works, there has been little opportunity for taking in hand projects having for their object the development of the resources of the country by means of irrigation. This is, however, the less to be regretted when it is reflected that, before means are taken to greatly increase produce, the natural difficulties of the district must be overcome by the construction of practicable roads, to render the transfer of goods from one part to another feasible. Roads must precede works of irrigation, though there is no doubt that the former are now in so forward a state as to render it advisable to set about the latter as soon as agency for projecting them can be provided.

86. During the past year a commencement in this respect has been made, the services of Lieutenant Griffith having been placed at my disposal for the purpose of examining certain situations, in the

north-eastern part of the Collectorate, stated to be suitable for the construction of irrigational dams. I have not yet received Lieutenant Griffith's report, which I am now awaiting; but I have reason to believe that one or two of the sites proposed will be found to offer sufficient facilities for the purpose required, to enable me to submit, shortly, projects of some extent.

87. An estimate prepared by Mr. Hart, C. E., for repairing the Bunds of the old Memadapoor Tanks in the Beejapoor Talooka, has been during the year submitted, approved, and sanctioned; and the additional assistance required for carrying out the work, applied for, and promised by the Chief Engineer of Public Works in the 2nd paragraph of his letter to Government No. 9692, of 25th November last, is now only awaited, to enable me to commence the work.

88. While on the subject of irrigational works, I venture to observe that, while traversing the districts, it has struck me that a continuous and complete system of small works would be likely to be found more quickly effective, and more likely to meet the immediate requirements of the country, than large, heavy undertakings, which from their magnitude and scope provoke discussion, and which take years to arrange and decide upon, and still longer to carry out when sanctioned.

89. The Sattara district is intersected with small, lively, and perennial streams, which might be bunded up at every half-mile, and, throwing off water-courses right and left, would completely irrigate the valleys along which they pass.

90. Such small bunds would be easy to design, easy to execute, be soon done, and there could be little difference of opinion regarding them.

91. The only thing that is required is agency to project them; for such a scheme should be the whole and sole business of one or more qualified men appointed for this special purpose.

92. The appointment of one, at least, Irrigation Assistant, with an establishment of two good Surveyors, is, I think, one of the great requirements of this Collectorate; and if Government should think fit to supply the want, I have great hopes that I should be able very

speedily to commence a system of works which would not only very greatly benefit the country in general, but would also, as a necessary consequence, increase very much the revenue, and prove a profitable speculation to the State.

93. In connection with irrigational works may be mentioned the scheme for supplying the town of Sattara with water. The idea of bringing the supply from the Atalee Springs by means of iron pipes, which was started by my predecessor, Captain Hart, has, on account of the smaller yield of this source, being abandoned in favour of a proposition for obtaining the water needed from the river Yenna, a source never likely to fail.

94. Lieutenant Griffith has been named for the duty of preparing data for the project; and preliminary examinations are now being made, and I trust to be able to have plans and estimates ready for submission before very long.

95. In regard to buildings, plans and estimates for Moonsiffs' Court-houses throughout the Collectorate have been prepared and submitted.

96. Plan and estimate for Mahalkurries' Cutcherries are nearly ready, and will be submitted immediately.

97. The project for a central Lunatic Asylum at Dapoolee, the duty of preparing which has fallen to me in addition to the by no means light work of my own Collectorate, has of necessity been laid by during the working season. I have found it impossible to prepare the voluminous plans and estimates, the labour of which must devolve on myself alone, while incessantly marching about, and at a time when I have had my attention most fully occupied with works in progress. I will, however, get in the designs, which are in a forward state, in time for the next Budget.

Agency.

98. I have had sufficient European assistance of the upper and subordinate grades at my disposal to enable me to carry on the works, that have been done this season, without any great mistakes or failures; but if I had had more, particularly of the better class, I could, by

ensuring a more minute supervision of details, have effected reductions on the cost of work executed, at least equal to the amount of pay to one or two Assistants. On this subject I have had lately to report, and I need only now say that Government being its own contractor, the more effective, minute, and close superintendence it can provide for, the better economy it will be found in the end.

99. Myself and my Assistants of all grades have had our hands so completely full of works in actual progress, that we have had little leisure or opportunity to turn our attention to prospective wants, or to procure data for drawing up new projects having for their object the development of the resources of the country; we have, however, not altogether neglected this important branch of our duties, as will be gathered from the preceding parts of this report, which speak of designs and estimates under preparation for the next Budget. Any extensive scheme for the development of this district by means of public works, preliminary preparations for which would have to be carried on simultaneously with the same amount of actual work which has lately been, and which is likely to continue for sometime yet to come, would, however, necessitate a corresponding increase of professional assistance.

100. I have been much inconvenienced by the removal of three Assistants during the official year, Lieutenants Merriman and Duncan and Captain Houghton, and although these vacancies have been filled up, yet this has not been effected without some considerable delay; and such changes occurring, as they have done, during the working season, could not fail to be prejudicial in some degree to the progress of the works.

101. I am of course aware that reliefs and changes of this nature must, in the natural order of things, occasionally take place; but, at the same time, I think the necessity of effecting them during the season of active operations, that is from October to June, should be avoided as much as possible.

102. One of my greatest difficulties, and one that has this season given me more trouble than any other, has been in regard to the supply of masons' labour. I have had of this class on my works

about 400 men employed, and I could, could I have procured them, have provided work for a great many more.

103. The obstacles to my success in procuring a sufficient number of masons to meet the requirements of the works have been—

1st. The competition of the Railway works.

2nd. The objection that work-people of this class have to taking service on or near the Ghauts, where my heaviest works have been.

104. In regard to the first point, I see very clearly that if we hope, as I trust we do, not only not to relax our efforts in respect to public works, but even to increase them, we must abandon our traditionary rates and prices, and compete in the labour market with the Railway Contractors and others.

105. At present the rates of pay of artificers, on which our estimates are calculated, are considerably lower than those which this class obtain on the Railway works, and the consequence is that all our good men leave us, and we have to supply their places as best we can, with learners and beginners, whom the great demand brings into the field, and who come to our works to get a little practice and instruction, and who desert us for the advantages held out elsewhere, as soon as they begin to know something of their business.

106. With such a state of things our work is not always as good or as cheap as it might be, and it is almost impossible to enforce rules and punishment, in respect to quantity or quality of work, without driving away men who are only too ready to leave on the slightest provocation ; we have in fact to humour the inferior men we can alone procure, or run the risk of having our work stopped altogether.

107. The remedy is clear : we must compete and pay as good prices as others do, in which case we shall be quite able to hold our own.

108. In regard to the second cause of difficulty, nearly all classes of Natives have such an objection to the immediate neighbourhood of the Ghauts, that it is most difficult to keep bodies of men together in such situations. The Ghauts are cold and damp, water is scarce, there are no villages, grain is dear, and the people dread wild animals.

All these causes, combined with the comparatively low rates of pay given on our works, are most inimical to our proceedings; and on the Koombarlee Ghaut desertions have been numerous and continuous throughout the whole season.

109. So opposed are the masons in particular to working on the Ghaut portion of the Koombarlee Ghaut line, that I have hardly ever ventured to send them there in large bodies; but have been obliged to move them in small numbers gradually westwards along the line, keeping them well in arrears of pay. Even with these precautions, I have invariably found that they have deserted on the first opportunity, some to take service again at the eastern end of the work, others never to return.

110. I may safely say, that on the Ghaut, I have never been able to keep one good mason for any length of time; only low-caste men and learners, who were doubtful about getting work elsewhere, could ever be induced to remain, and from this cause it has been most difficult to get either enough or good work; as on any attempt to fine, or even speak harshly to the men, they (knowing our difficulties) would shoulder their hammers and walk off.

111. The scanty supply of skilled labour in this part of the country must for some length of time be a great impediment to any very extended system of public works. Two or three years ago no public undertakings worth speaking of were in progress, and of course the district only produced a sufficient number of artisans to supply the existing demand; since then, not only have the Railways been taken in hand, but a great impetus has been given to public works of all kinds, and the supply of artificers is not now equal to the demand. The demand, it is true, is rapidly increasing the supply, as I can answer from my own observation of the number of men who are now in training as masons, but it will be many years before a sufficiency of this class can be raised.

112. In respect to common labour, I do not anticipate any difficulty. The Bigarees who take service with us are for the most part also cultivators, and are very disinclined to leave the immediate vicinity of their villages, even for a considerable increase of pay. I find

indeed the greatest difficulty in moving bodies of these men from one adjoining work to another. Concan men will not work far to the eastward of the Ghaut ridges, and Deccan men will seldom take employment on the Ghauts.

113. I had hoped before this that some steps would have been taken to improve the prospects, and therefore the efficiency, of the Clerical branch of the Department. This class is the only one now which has not in some degree benefitted by recent changes, and I trust that some measures for its advantage have already, or will shortly, engage the attention of Government.

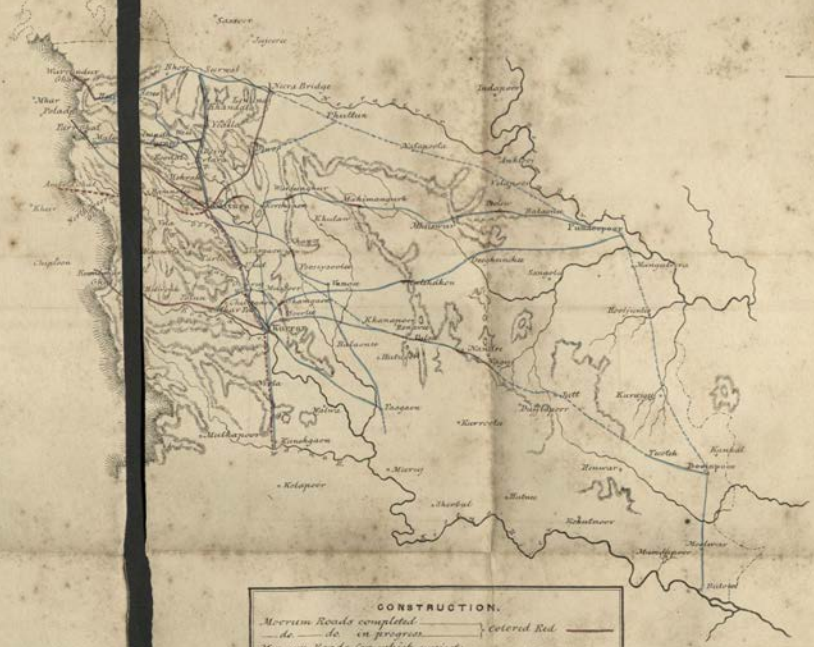
114. It seems quite anomalous that while the prospects of all other branches have undergone an improvement, this useful one alone should have received no encouragement. It never was a well paid Department, and now that its duties are so greatly increased to keep pace with extended operations, it is, I think, very ill paid. I have made frequent representations on the matter, and hope that something may soon be done. The comfort and efficiency of an Executive Officer depends in a great measure on the quality of his office establishment, and his opportunities of attending to the more important branches of his duty are greatly increased by his being well assisted. I would, therefore, once more respectfully state my conviction, that it is the very falsest economy to cause the frittering away the time of a highly paid professional Officer by imposing upon him, for the sake of a saving of a few rupees in the salaries of his clerks, the necessity of perpetually occupying himself by attending to petty details of accounts and returns.

115. In every office of any extent there ought to be one at least well paid subordinate, of a better class than most of the present Head Clerks on 60 or 70 Rupees per mensem; this individual should have the control of the minutiæ of the Account Department as an "Office Assistant," should be well paid, be responsible, and might be called upon to furnish security.

116. In my last annual report I made a few remarks on the necessity which appeared to me to exist for Government establishing a central depôt for the supply of "plant," or mechanical appliances, to the different works in progress. I do not know whether my remarks

Plan No. 2 of 1867

SKETCH MAP
OF THE
SATTARA COLLECTORATE,
SHOWING THE LINE OF ROAD CONSTRUCTED
IN PROGRESS, SANCTIONED, AND PROPOSED.


Wurnadur
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Yerla Bridge
Yhullur
Yhullur
Khodur
Mahimangurk
Mahimangurk
Tarsoodee
Yamoor
Khanapoor
Khanapoor
Mahsoor
Mahsoor
Tasgaon
Kurrood
Kurrood
Kurrood

attracted any attention or not, but I can only say, that further experience only convinces me of the advisability, if not necessity, of the measure I advocated.

117. Unless something of the kind is done, we shall go on to the end of our day getting over what has to be done by means of the rudest makeshifts. Government undertakes its own Engineering supervision, and is, besides, its own contractor; it should, therefore, as every wise contractor does, take measures for supplying its agents with every appliance to economise labour that may be required, but which at the same time may be out of the unaided reach of the person entrusted with the conduct of operations.

118. Officers in charge of detached works of no very great extent, cannot supply themselves with expensive appliances; but they would be very glad to avail themselves of such helps, could they procure them on loan, paying of course a reasonable amount for wear and tear and depreciation in value.

119. By adopting some plan of this kind, Government would get their works better, more quickly, and more cheaply done, whilst the cost of the "plant," being paid for by the different works on which it might be used, would entail no extra expense on the State.

I have the honour to be, Sir,
Your most obedient Servant,
M. K. KENNEDY, Captain,
Executive Engineer, Sattara Collectorate.

Executive Engineer's Office, Sattara Collectorate,
Camp at Waee, 25th May 1857.

No. 1287 OF 1857.

PUBLIC WORKS DEPARTMENT.
Superintending Engineer's Office, S. P.,
Sattara, 30th May 1857.

To the CHIEF ENGINEER OF PUBLIC WORKS, Bombay.

SIR,—I have the honour to submit Captain Kennedy's annual report of proceedings in the Collectorate under his executive charge, for

the official year ending 30th ultimo. Captain Kennedy's report is so clearly drawn up, that I have little left me to add, than that the works I have inspected during my recent tour give evidence of great and constant supervision, not only on the part of that Officer but on all concerned and connected with him. When I first started on my tour in November last, I visited the several works in hand in the north-western direction of the Collectorate. At that time the Kamatkee Ghaut had not been commenced for the reasons stated by Captain Kennedy, and but little had been done to the road between Bhore and the Wurrundur Ghaut. The works at this Ghaut were being steadily carried on, and were then in a very advanced state, and with that I saw I was as regards execution satisfied. But this Ghaut, on the whole, will not reflect credit on the Public Works Department as an engineering work; for I consider there are portions which will ever be considered as evincing anything but a scientific mode of overcoming a difficulty. I allude more particularly to the old pioneer fashion of descending a Ghaut by *sharp zigzags*, which obtain at this Ghaut: yet with all this style of descent the gradients are steep in places—so steep, that it is a wonder they were ever permitted or sanctioned. When I say steep, I mean such as 1 in 14 to 1 in 18: however the deed is done, and it can only now be a subject for regret.

2. On returning I visited the Pussurnee Khind, which I found in progress. The original track had been widened out before I visited it, and Captain Kennedy was then completing that portion which had been omitted in the original estimate. This was all that was in progress in the north-west angle of the Collectorate.

3. On my return from the southern districts of my Province, I inspected the Kurar, Patun, and Koombarlee line; and have much satisfaction in reporting that I was well pleased with the progress of the works throughout. The style of finish of all the bridges and drains was satisfactory. Several of the bridges I particularly admired, not so much the design as the excellence of the work executed: I was particularly pleased with the style of the Helwak Bridge, for although the piers and abutments only were up to the springing course, yet that I saw gave evidence of the whole. The Assistant Overseer in

charge understands his work well: Captain Kennedy also spoke highly in his praise, as evidencing skill and pride in his work. Of the drains, I need but remark that the wing walls of dry rubble masonry spoiled the general effect; moreover, I doubt if they will last any length of time: when all the rest of the work is of a pucka description, it is but a poor saving to alter the style to that which has a sorry appearrance and which will eventually fail. Of the masonry at the Koombarlee Ghaut much is very good; some more superior than need be; but portions I had cause to find fault with. Captain Kennedy, and all in charge of the works, made sad complaints on the want of good masons; they assured me it was with the utmost difficulty they could get other than men but one remove from coolies to execute that I saw. Mr. Stapleton is a good man, and it is evidently not his fault. I saw quite sufficient to convince me that he has a perfect knowledge of his profession; and that the *fault* lies in that alluded to in Captain Kennedy's report paras. 103 to 111.

4. I beg to draw attention to that portion of Captain Kennedy's report under the head of Agency, particularly as regards that relating to an Office Assistant and to the "plant" for general use. The first, I am of opinion, from what I have noticed during the past two years, that Executive Officers, who have works such as those in the Sattara Collectorate, should be relieved of much of the minor details of accounts and other office drudgery. As regards "plant" for the carrying out of works of importance, it would tend to facilitate operations, and a reduction of labour—one very great consideration, for the less the number of hands to superintend the better and more economically must work be executed: of this there cannot be a question, 1000 men are better looked after and controlled than 1500 or 2000. This item "plant" is therefore worthy of thought.

I have the honour to be,

Sir,

Your most obedient Servant,

J. KILNER, Lieutenant Colonel,

Superintending Engineer, Southern Provinces.

No. 3803 OF 1857.

PUBLIC WORKS DEPARTMENT.

Office of Chief Engineer of Public Works,
Bombay, 20th July 1857.

To the Right Honorable LORD ELPHINSTONE, G.C.H.,
Governor and President in Council.

MY LORD,—In compliance with the instructions contained in para. 6 of the Government Resolution under Mr. Secretary Hart's Memo. No. 1806, of the 27th November 1855, I have the honour to submit a report, No. 761, dated 25th May 1857, by Captain Kennedy, Executive Engineer Sattara Collectorate, of the operations of his Department for the year 1856-57, together with a letter from Lieutenant Colonel Kilner forwarding the report, No. 1287, of the 30th May 1857.

2. The reports required by the Resolution above alluded to for last year, 1855-56, were not submitted for the following reasons. The nature of the reports required was misapprehended by the generality of Executive Officers; the reports, such as they were, were not received till very late, and were unaccompanied by any remarks from the Superintending Engineers. Moreover, the submission of the administration report of the proceedings of the Department, and of the detailed annual progress report, before the whole of the reports of Executive Engineer's operations were received, seemed to render the submission of these latter reports comparatively unimportant. Finally, the absolute engrossment of my whole time and thoughts in other official business, which was at that time more extensive than I found it possible to manage, would alone explain my setting aside those portions of it which were either least important or the materials for which were most defective.

3. Captain Kennedy's present report I consider highly satisfactory. It gives evidence of his intelligence and activity, and of his zeal and success as an Executive Officer; and Lieutenant Colonel Kilner remarks that the works which he visited gave "evidence of great and constant

supervision not only on the part of that Officer (Captain Kennedy) but of all concerned and connected with him." In the extent of work done under his superintendence no other Executive Officer approaches him. My appreciation, however, of this very meritorious Officer's practical qualifications and active proceedings does not extend in all cases to his opinions, some of which I think crude and ill-considered. I proceed to notice shortly the heads of his report.

4. Captain Kennedy begins with his principal work, the Koombarlee Ghaut. The description of its progress and present state is interesting, and it is illustrated by a photographic picture of the Patun Bridge and a sketch plan of the road. Captain Kennedy has not been able to spend the whole sum assigned for the year's expenditure, 2½ lakhs. Nearly 40,000 Rupees remained unexpended on 30th April. He considers, however, that he has advanced the work as much as could be profitably done with a young establishment and want of sufficient skilled labour. Lieutenant Colonel Kilner thinks the execution of the bridges and drains excellent, with the exception of the dry rubble wing walls, which, he remarks, "spoiled the general effect," and of which he doubts "if they will last any length of time." Of the masonry works on the Ghaut, Lieutenant Colonel Kilner remarks that "much is very good," some better than he thought necessary, but that with portions of them he "had cause to find fault." Captain Kennedy promises that the road from Helwak to Kurar shall be open to traffic after the present monsoon, and ventures to engage to have the whole distance from the western foot of the Ghaut to Kurar, 46¾ miles, ready to open to the public before the close of the official year (para. 17). This prospect is gratifying, and makes me the more regret that plans and estimates for the small portion necessary to complete the road from Chiploon to the foot of the Ghaut (about seven miles) have not as yet been prepared. They have been called for from Mr. Armitstead.

5. Captain Kennedy reports favorably of his Assistants on this work. He writes in his 22nd paragraph—"I am highly satisfied with the manner in which Mr. Hart has conducted the heavy duties which have fallen to him, and with the zeal and ability with which he has

afforded me assistance." He states that he shall probably soon bring forward Supervisor Stapleton's name for promotion. The seven Assistant Overseers employed on this road are described as having worked very well and been very steady; but of Serjeant Assistant Overseer Wallinger it is more specially observed that he "has displayed considerable aptitude for supervision, has taken great interest in his duties, and has done some very good and cheap work" (para. 23). Lieutenant Colonel Kilner writes of Mr. Stapleton "that he has a perfect knowledge of his profession," and of Serjeant Wallinger "that he understands his work well."

6. The twenty miles of cleared road from Waee to Sheerwul, with the intervening Kamatkee Ghaut, came it appears under the suspension of new works ordered by Lieutenant Colonel Baker's letter No. 2049, of the 6th May 1856. Instead, therefore, of the whole sum sanctioned, Rs. 45,231, being spent in 1856-57 as intended, only Rs. 7,172 were disbursed; the clearance remained unattended to; but of the Ghaut, which is 2 miles 5 furlongs in length, one mile was opened to a width of eighteen feet, and another mile to a width of from four to eighteen feet. Captain Kennedy writes in para. 33—"Lieutenant Sellon has had charge of this work, and I have had every reason to be satisfied with the progress that has been made and with the assistance he has afforded me."

Accompaniment to Mr. Secretary Hart's letter No. 1252, of 22nd May 1856.

7. Of the Wurrundur Ghaut Captain Kennedy writes, para. 37, that "the whole Ghaut is now opened out to full width, with the exception of a very small portion here and there in the rock-cuttings. The retaining walls * * * have been finished, and fifty-eight drains and fifteen stone dips have been in progress." He adds (para. 38) "The road will be open for cart traffic the first thing after the rains." The sum proposed for disbursement on this Ghaut, in 1856-57, Rs. 45,298, was very nearly all spent as proposed. On Captain Houghton being relieved, Surveyor and Builder Brock, assisted by Serjeant Assistant Overseer Wholohan, carried on the Ghaut, and Captain Kennedy adds, "generally speaking has done so to my satisfaction." Mr. Brock was very inconveniently absent for six weeks, to give evidence in the

Supreme Court, during the height of the working season. To this absence Captain Kennedy in part attributes that the line was not opened to cart traffic at the close of the official year, as he at one time fully expected. Serjeant Wholohan, on whom devolved the superintendence of the work during Mr. Brock's absence, has, Captain Kennedy writes, " behaved very well, and by his steady and careful conduct has given me considerable satisfaction" (para. 44).

8. I am sorry to observe from Lieutenant Colonel Kilner's report, para. 1st, that some portions of the road over the Wurrundur Ghaut have been very unscientifically laid out, descending by sharp zigzags, yet with gradients so steep in places " that it is a wonder they were ever permitted or sanctioned * * * such as 1 in 14 to 1 in 18." With the execution, however, of what he saw, Lieutenant Colonel Kilner was satisfied.

9. A part of the trunk road from Belgaum to Poona, 30 miles 1 furlong in length, between Kunneegaum on the Warna River and Kurar, has been opened over deep black soil, for Rs. 6,244, in 1856-57, and the work done satisfactorily under Mr. Whittenbury, Assistant Executive Engineer; but Captain Kennedy justly considers this work as of little value, except as a preliminary operation over such a soil. Captain Kennedy has also cleared 30 miles 1 furlong 110 yards of a line of road from Tasgaon to Nahavee Ghaut, being all that lies in the Sattara Collectorate, at a cost of Rs. 7,608. This work was also superintended by Mr. Whittenbury, but Captain Kennedy complains that Mr. Whittenbury misunderstood or neglected the instructions given to him by Captain Kennedy about making some rough drains.

10. The Pussurnee Khind road, commenced many years ago by Captain Hart, and on which large sums of money have been spent, has been at last opened as a bullock track, so as to connect the town of Waee with Mahableshwur, and a toll was put on the road in April last. Rs. 2,468 only were spent last year in the completion, which was principally superintended by Serjeant Overseer Malligan, and Captain Kennedy reports that "it has been fairly done."

11. On emergent sanctions Captain Kennedy reports the expenditure of Rs. 4,750, during 1856-57, in opening that part of the Mahar and Loonud road which lies between the Neera River near Hurosee and Bhore, and which was finished on 30th April, with the exception of two miles at the western end. It is described as being "over very difficult country," nevertheless this cleared line for carts will be open after the monsoon. Parapet walls to the Mahableshwur Ghaut and a kitchen to the Travellers' Bungalow at Ateet have been built. The repairs of the bund of the Yenna Lake on Mahableshwur are not yet complete.

12. I do not think it necessary to follow Captain Kennedy in his descriptions of projected works, or his discussion regarding the best line of communication between Mahar and Sattara. With respect to irrigational works, he remarks (para. 85) that "roads must precede works of irrigation," and, in para. 88, that "while traversing the districts it has struck me that a continuous and complete system of small works would be likely to be found more quickly effective than large, heavy undertakings," the latter requiring so much time for discussion, arrangement, and execution. For the projection of such works he advocates "the appointment of one at least Irrigational Assistant with an establishment of two good Surveyors" (para. 92) as likely to be profitable in its effects. Lieutenant Griffith is, it appears, occupied with the project of bringing water to Sattara from the Yenna River. Captain Kennedy promises designs for a central Lunatic Asylum at Dapoolee in time for next Budget (para. 97). This work is not in Captain Kennedy's Collectorate, and the burthen of it ought not to have been thrown upon him, but I was unable at the time to suggest the name of any other Officer available for preparing the plans.

13. On the subject of agency, Captain Kennedy advocates, as he has done before, an increase of European assistance of the upper and subordinate grades, particularly that of the better class, because he believes he could thus "have effected reductions in the cost of work executed at least equal to the amount of pay to one or two Assistants." I am sceptical on this point; my own opinion, founded on considerable experience, being that Captain Kennedy has had ample

subordinate assistance, and would have had sufficient assistance of a higher grade, had there not been so many changes and reliefs. Any additional Assistants must be, in my opinion, more or less at the charge of Government. They would not be able, by any increased minuteness of supervision, to save the amounts of their comparatively high salaries.

14. In para. 102 Captain Kennedy enters on the subject of the difficulty of procuring masons, and argues at some length on the propriety of raising their wages to meet the Railway competition. Captain Kennedy ought to know that it entirely rests with himself to give proper wages, and to raise his estimate rates in proportion, explaining however, to my satisfaction, from time to time, to what extent and why the latter step is necessary. It appears from Captain Kennedy's report that there is additional difficulty in getting masons to undertake work near the Ghauts (paras. 103 and 108 to 111) and that labourers also dislike the Ghauts or leaving the vicinity of their villages, but he does not anticipate any difficulty about common labour (para. 112).

15. In paras. 113 to 115 Captain Kennedy expresses his opinion that the clerks in Executive Engineers' offices are not sufficiently paid, and that "in every office of any extent there ought to be one at least well-paid subordinate of a better class than most of the present head clerks on 60 or 70 rupees per mensem." He thinks this subordinate should be an "Office Assistant." I cannot agree with Captain Kennedy in his opinions about increased assistance, either for superintendence or in his office. They are already too expensive with reference to the works executed, and will probably continue to be so under the existing system. It may also be observed, with reference to office salaries, that their amounts are necessarily regulated in great measure by the salaries of offices in other departments of the public service.

16. Captain Kennedy's four last paras. are devoted to the subject of "Government establishing a central depôt for the supply of 'plant,' or mechanical appliances, to the different works in progress" (para. 116). On this point I shall content myself with observing that the few attempts which have been made to meet the expressed wishes of

Executive Officers in such points, have had no useful result; while much trouble has been entailed on this office, and on those of the Garrison and Dockyard Engineers. No article of this or of any other sort from England is permitted to be procured except by indent on the Honorable Court of Directors, and if any arrangement of the kind proposed by Captain Kennedy is to be attempted, there must be an officer with a suitable establishment appointed for the sole object of obtaining, receiving, distributing, and accounting for such mechanical apparatus as it may be thought advisable to procure.

I have the honour to be,
My Lord,
Your Lordship's most obedient Servant,
C. WADDINGTON, Major General,
Chief Engineer of Public Works.

POONA COLLECTORATE.

No. 1459 of 1857.

PUBLIC WORKS DEPARTMENT.

Executive Engineer's Office, Poona Collectorate,
Poona, 22nd September 1857.

To the SUPERINTENDING ENGINEER SOUTHERN PROVINCES.

SIR,—With reference to the Superintending Engineeer C. P.'s Memo. No. 5227, of 14th September 1857, I beg to report that the principal works I have been engaged in, during the year 1856-57, have been the preparation of plans and estimates for the Nassik Irrigation Scheme, as well as the charge of the Executive Engineer's Office Poona Collectorate.

WORKS OF IRRIGATION.

In December 1855 I commenced the survey of the Nassik Irrigation Scheme, which was completed in the following May.

Plans and Estimates.—A detailed report has been forwarded to the late Superintending Engineer, Colonel Scott, in which it will be observed that a very large extent of most valuable land can be irrigated from two reservoirs; one on the Godavery, about four miles west of Nassik, and another, west of a village called Bhagoo, situated about twelve miles south-west of Nassik. This reservoir is of vast extent, and capable of reserving as much water as will amply irrigate all the lands between the proposed canal and rivers Dharna and Godavery, as far as a village called Korhaley, about fifty miles south of the proposed reservoir. The Godavery reservoir is proposed to irrigate the lands south and east of Nassik as far as a village called Wozur, there to be connected by the Bangunga, as well as a large portion of the lands between the rivers Dharna and Godavery.

2. The lands proposed to be irrigated are for the most part of a most productive nature, and would return an enormous revenue. The cost of the work appears large, but would in a few years pay the

expense, at increased taxation of Rs. 4-8-0 per acre, over an amount of irrigation comprising upwards of 272,720 acres of land.

3. The supply of water for the proposed works is never-failing, being got from the Western Ghauts, and, on the lowest calculation of rain-fall, is able to supply a great deal more water than is necessary; a detailed report of which has been previously made, which I have no doubt will satisfy doubts on the subject.

4. During the progress of the survey the Zemindars have made several anxious inquiries as to when they might expect to enjoy the benefits of irrigation, and expressed themselves to be most anxious for it, and proposed to pay a tax of Rs. 5 per acre for it, which I think a very low rate when compared with the expense of irrigation from tanks, which costs upwards of six times that sum, according to Captain Meadows Taylor's report. The advantages to be derived from the irrigation of this large district are too manifest to be denied, and, as a reproductive work, would compensate very largely for the outlay.

5. The plans, sections, and other detailed drawings were done by me during the months of June, July, August, and September 1856, which I regret are not in such detail as I would wish; but the undertaking was so large, and, being unassisted, I was obliged to be content in giving all the information the time would admit of, as I was then under the impression it was required for the next Budget. The survey of such a detail could not be sufficiently detailed sooner than three years without Assistants, but I can confidently answer for the critical accuracy of the levels, &c. which I deem of primary importance, even if other minor matters were defective.

6. During the month of October I made a survey of the Ambegaum Valley, a place I selected for bunding up water for the supply of the Camp of Poona, a distance of about five miles south-west of Poona. A report, plans, sections, and estimates were made of the whole project, which have been given to Colonel Scott. It has been got up in rather a hurry, being anxious to have it done before the 1st November. The survey, &c. have been accurately made, and sufficient information given to prove the scheme effectual. A reference to the abovementioned report, plans, &c. will furnish all the information connected with it.

7. On the 1st of November 1856 I received charge of the Executive Office of the Poona Collectorate, the work of which are principally confined to the annual repairs to roads and bridges, the building of the Poorundhur Hospital, the four large bridges over the Nassik Road, and sundry other petty works to bungalows, &c. In the whole Collectorate there are 356 miles 1 furlong 146 yards of road made, 103 miles 1 furlong 179 yards metalled, 252 miles 7 furlongs 187 yards moorumed. The metalled roads run from Khundalla to Patus *viâ* Poona, and from Kirkee to the end of the Collectorate on the Ahmednuggur Road. The most of the latter road was lately metalled. The moorum roads extend from Kirkee to Ambegaum, from Sikrapoor to near Wurgaum, from Poona to the Neera Bridge, from Patus to Hingungaum, and from Poona to Singhur. The traffic on those roads have been very great, especially on the Sholapoor and Bombay Road, which were principally taken up with carriage of the permanent way for the Great Indian Peninsula Railway. The road from Poona to Hingungaum was very much worn down by traffic, and it was deemed advisable to put down an additional quantity of metal to meet the traffic of the years 1857 and 1858. The road from Poona to Khundalla was also very much worn down from the enormous traffic. The following is the traffic taken for a week at Khundalla, which will show what expense was on the road materials for the year:—

TRAFFIC TABLE.

		Road from Poona to Khundalla.
		1856.
Imports	Carts	4,414
	Bullocks, &c. ..	3,476
Exports	Carts	4,233
	Bullocks, &c. ..	8,703
Total	Carts	8,647
	Bullocks, &c. ..	12,179

Next in importance as to traffic is the road from Nuggur to Bombay *viâ* Sikrapoor, Chakun, and Wurgaum, which is composed of moorum. It is a direct road for those going to Bombay from the Nuggur direction, as the road leaves Poona considerably to the south.

8. The traffic on the Nassik Road is very little compared with those recently alluded to, but I think it would be greatly increased if the Chundunpooree Ghaut was completed.

9. The cost of maintenance on the Bombay, Poona, and Sholapoor Road is very great, amounting, on the metalled part, to Rs. 358-9-11 per mile, and on the moorum to Rs. 97-11-3 per mile in ordinary years; but in consequence of the increased traffic alluded to, the expense will be upwards of one-third more. It is however to be hoped, that when the Railway is opened, the expense will proportionally decrease.

10. The road from Poona to Sassoor *viâ* the Deweh Ghaut was completed this season, as well as the direct road from the top of the Deweh Ghaut to Jejooree. The latter work is in some respects incomplete: there are some drains and a bridge over the Kurra River not done, as well as a want of moorum on the portions of the road running through black soil, which is at present greatly cut up.

11. The Kurra Bridge was built up to the level of the springing of the arches, and the centres erected; but from a heavy flood in the river the latter were carried away. This is the only instance of failure in any of the works of this Collectorate since I assumed charge. The kerbing and metalling the road from Holkar's Bridge to Wagolee has been completed, and is now in excellent repair, as well as the remainder of the road to the end of the Poona Collectorate.

12. The preparation of building materials for the four large bridges on the Nassik Road was commenced, and a large quantity of stone dressed, as well as rubble been collected. It is not proposed to commence the building until the next dry season, as the foundations could not be got in before the monsoon. The work performed for those bridges has been done by contract; the rubble laid down at a certain rate per 100 cubic feet according to the distance of carriage, and the cut stone at four annas per cubic foot, including everything delivered on the work.

13. The new Hospital at Poorundhur was in progress when I took charge, and is now nearly completed. It has been built by contract. Except the Kurra Bridge, this is the only work done in the Poona Collectorate by contract.

14. There is yet a good deal to be done to make the existing roads of the Collectorate complete as to draining and bridging: the only road that may be called complete is that from Poona to Khundalla.

15. The following is a list of works in progress in 1856-57 :—

Name of Works.	Estimated Amount.			Actual Expense, date up to 1st May 1857.			Remarks.
	Rs.	*a.*	*p.*	*Rs.*	*a.*	*p.*	
Completing Road from Poona to Sassoor	80,526	0	0	80,190	12	6	Completed.
Bridges on the Poona and Nassik Road— Indrownee Bridge, Bhama Bridge, Bheema Bridge, Ghore Bridge	1,65,613	0	0	6,853	14	4	Not completed.
Kerbing and metalling Road from Jamsetjee Bund at Poona to Wagolee and branch from Holkar's Bridge	19,445	0	0	19,168	4	2	Do.
Do. do. from Wagolee to end of Poona Collectorate	20,500	0	0	8,290	14	8	Do.
Road from Deweh Ghaut to Jejooree.	14,237	0	0	12,830	9	2	Completed.
Kurra Bridge	11,128	0	0	3,748	14	6	Not completed.
Wells on Bhore Ghaut	2,060	0	0	2,029	9	6	Completed.
Huts for the Travellers' Bungalows..	1,086	0	0	910	0	0	Do.
Windows to ditto	1,078	0	0	885	0	0	Not completed.
Furniture to Sassoor Travellers' Bungalow	152	0	0	133	0	0	Completed.
Seats to Sassoor Travellers' Bungalow Privy	19	0	0	17	15	4	Do.
Office Furniture	262	0	0	89	0	4	Not completed.
Ordinary repairs to Roads and Bridges	98,669	0	0	67,332	13	3	Completed.
Naraengaum Dam	420	9	5	420	9	5	Do.
Alterations to the Mahalkurry's Cutcherry at Owserry	1,344	0	0	1,319	1	1	Do.
Stable to the Assistant Collector's Bungalow at Pargaon	575	0	0	534	2	6	Do.
Building a portion of the Poorundhur Mamlutdar's Cutcherry	.....			110	0	0	Do.
Stable and Cattle Pound of the Mamlutdar's Cutcherry at Khurkalla..	309	0	0	441	12	10	Do.

Name of Works.	Estimated Amount.			Actual Expense, date up to 1st May 1857.			Remarks.
	Rs.	*a.*	*p.*	*Rs.*	*a.*	*p.*	
Drains between Neera Bridge and Jejooree	732	0	0	702	3	9	Completed.
Gravelled Road with Culverts between Chundapooree Ghaut and Nandoor	27,148	0	0	28,554	11	0	Completed, with the exception of 2 miles.
Raising certain portion of Road between Daluz and Koombargaum beyond the reach of floods	8,081	0	0	158	1	0	Not completed.
Planting a Hedge for forming an Enclosure to the Travellers' Bungalow at Khundalla	54	0	0	49	0	0	Completed.
Repairing a Chupper to Neera Ferry.	24	9	0	24	9	0	Do.
Ordinary repairs to Buildings—Travellers' Bungalows	1,054	0	0	893	9	2	Do.
Repairs to Ferry Boats and Flying Bridges	1,216	0	0	1,148	14	5	Do.
Making a Chupper to the Kookree Ferry	13	0	8	13	0	8	Do.
Repairing the Post Office at Khundalla	90	0	0	85	8	7	Do.
Putting the Assistant Collector's Bungalow and Outhouses at Pargaon into a thorough state of repair	442	0	0	415	4	6	Do.
Repairs to the Assistant Collector's Bungalow at Ootoor	162	0	0	157	15	7	Do.
Bundara at Jowla	4,950	0	0	4,950	0	0	Do.
Raising a certain portion of Dam at Naraengaum	665	0	0	584	0	10	Do.
Building Rafts, Standards, and Tindalls' Houses for Kookree and Moola Ferries	5,306	0	0	5,275	12	2	Do.
Rebuilding a Protection Wall to the Well at Yewut	139	0	0	126	13	3	Do.
Drawing off the Water of the Khundalla Tank and clearing it again	70	0	0	33	14	0	Do.
Repairs to the Mamlutdar's Cutcherry at Khier	71	14	8	68	1	9	Do.
Repairs to the Assistant Collector's Bungalow at Chakun	322	0	0	394	12	6	Do.
Marking Road over Katruz Ghaut	300	0	0	1,415	9	1	Finished.
Extending the Grave Yard at Poorundhur	.....			45	6	9	Do.
Hospital at Poorundhur with Outoffices	24,530	0	0	12,283	3	0	Not completed.
Building a new Necessary and Cookroom for the use of Serjeant Major's quarters at Poorundhur	275	0	0	262	0	0	Completed.
Completion of the junction from main roads to Bazar at ditto	326	0	0	318	0	0	Do.

Name of Works.	Estimated Amount.			Actual Expense, date up to 1st May 1857.			Remarks.
	Rs.	*a.*	*p.*	*Rs.*	*a.*	*p.*	
Thoroughly repairing the Roof of the Hospital at Poorundhur	489	0	0	505	11	11	Completed.
Ordinary repairs to Poorundhur Buildings and Staging Pendalls on the Bombay Mail Road	942	0	0	533	4	3	Do.
Improving the Site for a new Burial-ground at Poorundhur.....	.....			3	2	8	Finished.
Filling up Shafts and levelling Ground at ditto.....	.....			5	6	7	Do.
Building three Buttresses to the Verandah Wall of the Hospital, and making certain alterations at ditto.	.....			102	8	0	Completed.
Putting up a Teakwood Railing to the Hospital.....	.....			8	4	0	Do.
Making alterations and additions to the Convict Jail at Poorundhur ..	.....			311	11	4	Not completed.
Making certain alterations to the Serjeant Major's quarters at ditto.	.....			63	9	0	Completed.
Clearing out Urinal Drain from the Hospital Privy at ditto.....	.....			3	6	0	Do.
Clearing temporary Road-ways from the main roads to Nos. 10 and 11 Bungalows at ditto	.....			56	0	0	Do.
Sinking three principal Wells at ditto.	.....			84	8	2	Do.
Clearing out the Public Wells at ditto.	.....			2	15	3	Do.
Marking out a Line of Road from Sassoor to Poorundhur	.....			4	4	4	Finished.
Building teakwood Railing to the Public Wells at Poorundhur.....	.....			42	13	0	Do.
Building masonry Steps to the new Privy attached to the Barrack Hospital at ditto	.....			28	8	7	Completed.
Removing large portion of Rock overhanging the upper Fort Road at ditto.....	.....			24	0	6	Do.
Prolonging a Terrace Wall in front of the Canteen at ditto.....	.....			22	13	0	Do.
Rebuilding a dry stone Parapet Wall to the Terrace in front of the Serjeant Major's quarters, Canteen, and Library at ditto.....	.....			138	11	11	Do.
Repairing dry stone Parapet Wall at the south end of the Privy at ditto.	.....			3	10	0	Do.
Repairing dry stone Retaining Wall from Byroo Gate to the new Privy.....	.....			194	14	10	Do.
Clearing the rank and unhealthy Vegetation from the sides of the Road at Poorundhur	.....			35	9	11	Do.

Name of Works.	Estimated Amount.			Actual Expense, date up to 1st May 1857.			Remarks.
	Rs.	*a.*	*p.*	*Rs.*	*a.*	*p.*	
Tiled Passage from the Hospital to the Necessary at Poorundhur	460	0	0	486	7	0	Completed.
Parapet Walls to the Wells at ditto.	385	0	0	375	6	2	Do.
Opening a Line of Road in a rough way for Carts from a Chowkey at the end of the City of Poona to the foot of the Katruz Ghaut	500	0	0	484	13	1	Do.

I have the honour to be, Sir,
Your most obedient Servant,
C. GERRARD,
Acting Executive Engineer, Poona Collectorate.

No. 3040.

PUBLIC WORKS DEPARTMENT.

Office of the Superintending Engineer S. P., Poona, 25th September 1857.

Transmitted to the Chief Engineer of Public Works, with reference to the 3rd paragraph of Lieutenant Southey's Memo. No. 4864, of the 10th instant.

J. KILNER, Lieutenant Colonel,
Superintending Engineer, Southern Province.

No. 5415 of 1857.

PUBLIC WORKS DEPARTMENT.

Office of Chief Engineer of Public Works, Bombay, 15th October 1857.

To the Right Honorable LORD ELPHINSTONE, G.C.H.,
Governor and President in Council.

MY LORD,—I have the honour, with reference to the Government Resolution under Mr. Secretary Hart's Memo. No. 2501, of the 2nd

September, to submit Mr. Gerrard's amended report (No. 1459, of the 22nd September 1857, of the operations of the Department of the Executive Engineer Poona Collectorate for the year 1856-57. This report is not accompanied by any Sketch Map of the Collectorate, nor has the Superintending Engineer Southern Province made any remarks upon it.

2. Mr. Gerrard commences his report by stating that his principal occupation, during the year 1856-57, has been in preparing his plans and estimates for the Nassik Irrigation Scheme, and in the charge of the Executive Engineer's Office Poona Collectorate. His survey for the Irrigation Scheme was commenced in December 1855 and completed in May 1856. "The plans, sections, and other detailed drawings," he states in his 5th paragraph, "were done by me during the months of June, July, August, and September 1856, which I regret are not in such detail as I would wish;" and he adds, "the survey of such a detail could not be sufficiently detailed sooner than three years without Assistants, but I can confidently answer for the critical accuracy of the levels, &c." In the preceding paragraph, Mr. Gerrard had given a general description of his project, and expatiated on the advantages of irrigating a large extent of fertile land at a very low rate as compared with irrigation from wells, and the prospect of an enormous revenue therefrom. This scheme for irrigation on a large scale from the Godavery and Dharna Rivers originated with Colonel Scott, and Mr. Gerrard's report and drawings were submitted by me to Government, together with some remarks by Colonel Scott, on the 1st December 1856. In the Government Resolution of the 9th December, under Mr. Secretary Hart's No. 3543, of the 23rd idem, the importance of this irrigational scheme was admitted, but it was declared to be by no means sufficiently matured. Directions were at the same time given that steps should be taken for maturing the scheme, and that the probable cost of carrying it into execution should be accurately ascertained. Your Lordship in Council concurred in the praise which had been bestowed on Mr. Gerrard for his energetic exertions.

No. 9803, of 1st December 1856, from the Chief Engineer of Public Works.

3. The accuracy of Mr. Gerrard's surveys and levels has not been questioned, and it was clearly most desirable that they should not be

lost to the State by being laid aside, and perhaps eventually forgotten, as some other laborious undertakings of the same sort have been. Had Mr. Gerrard been a well-qualified Hydraulic Engineer, there can be no doubt that he ought to have been employed in maturing his own work; but he showed himself, in the constructive designs which accompanied his report and survey, so little acquainted with the subject, that I could not venture to recommend him for the task. It occurs to me that Captain Hart might, on the completion of his present undertaking, be appointed to the special duty of maturing this project for irrigation from the Godavery and Dharna Rivers, and that, if this proposal be approved, it would be expedient at once to make over to him all Mr. Gerrard's papers relating to that project.

4. In October 1856 Mr. Gerrard made a survey of the Ambegaum Valley (para. 6), which he had selected, he states, as a fit place where a supply of water might be dammed up for the supply of the Camp at Poona, distant north-east about five miles. A report, plans, sections, and estimates were prepared, though "in rather a hurry," yet Mr. Gerrard adds that "the survey, &c. have been accurately made and sufficient information given to prove the scheme effectual." These papers were submitted to Government with my letter No. 10201, of the 20th December 1856, in which so numerous had been the projects, reports, and reviews on the subject previously submitted, and the correspondence so voluminous, that I found it necessary to epitomise our past proceedings. After describing the various schemes and remarking that none of them had been sufficiently matured to obtain the sanction of the Honorable Court of Directors, I showed that Mr. Gerrard's project was also in a very immature state, and recommended that an Officer should be deputed for the special purpose of examining all these schemes, of selecting the most promising among them, and bringing it before Government in the most perfect form which his experience and judgment might suggest. Your Lordship in Council was pleased to approve of my recommendation, and Captain Hart was appointed to the duty. Mr. Gerrard's design for his dam and waste weir had all the defects noticed in his former

Government Resolution under Mr. Secretary Hart's Memo. No. 160, of the 17th January 1857.

project for irrigation from the Godavery and Dharna Rivers, and his estimate of the cost was quite insufficient.

5. On the 1st November 1856, Mr. Gerrard received charge of the office and works of the Executive Engineer Poona Collectorate (para. 7). He states generally that his principal work has been the repair of roads, the construction of a hospital at Poorundhur, and the preparation of materials for the four large bridges sanctioned by the Honorable Court on the Poona and Nassik Road. It appears from the report that there are 356 miles 1 furlong 146 yards of made roads in the Tanna Collectorate, of which 103 miles 1 furlong 179 yards are metalled with broken stone and 252 miles 7 furlongs 187 yards with moorum; the former extending from Khundalla to Poona and thence to Patus on the Sholapoor line, and from Kirkee to the boundary of the Collectorate on the Ahmednuggur line. The moorum roads are on five lines, viz. from Kirkee to Ambegaum on the Nassik line, from Wurgaum to Sikrapoor (a connecting line between the Bombay and Ahmednuggur Roads), from Poona to Neera Bridge on the Sattara line, from Poona to Singurh, and from Patus to Hingungaum on the Sholapoor Road. The traffic on the road from Khundalla to Poona and thence to Hingungaum has been much increased during the past year by the carriage of materials for the Railway, and it was found necessary by the Executive Engineer to lay down additional material. The average cost of maintaining the metalled portion of this line had been in previous years Rs. 359 per mile, and that of maintaining the moorum portion Rs. 98 per mile. These rates have been exceeded by more than one-third during the year 1856-57. With reference to the roads in the Collectorate generally, it is observed in the 14th paragraph of this report that much remains to be done, the only complete road as to bridges and cross drains being that from Khundalla to Poona.

6. In his 10th paragraph Mr. Gerrard states that the road from Sassoor *vid* the Deweh Ghaut to Poona is completed. The direct road from Jejooree to the top of the Deweh Ghaut is stated to be in some respects incomplete. The Kurra Bridge is unfinished, and some more drains are required.

No. 53 in Statement 2 of Budget for 1856-57.

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The moorum laid on the black soil has not been sufficient, and the road is greatly cut up. The centerings of the Kurra Bridge were carried away by a flood (para. 11). A supplementary estimate for completing the bridge has since been sanctioned. Original estimate, Rs. 11,128; supplementary estimate, Rs. 2,786.

Government Resolution under No. 2686, of the 17th Sept. 1857.

7. The kerbing and metalling of the road from the Jamsetjee Bund to Wagolee, and of the branch road from Holkar's Bridge, are, it appears, completed. This road, with its continuation from Wagolee to the boundary of the Collectorate on the line to Ahmednuggur, is reported to be in excellent repair. It was on the latter portion that three experimental half-miles of metalling were laid down during the past year, as reported in letter my No. 3671, of the 13th July 1857.

No. 7 in Statement 2 of Budget for 1856-57.

8. For the four large bridges on the Poona and Nassik Road over the Indrownee, the Bhama, the Bheema, and the Ghore Rivers, estimates for which have been sanctioned by the Honorable Court of Directors, Mr. Gerrard states in his 12th paragraph that large quantities of stone, both rubble and dressed, have been laid down on the several sites by contract, and that he did not intend to commence building till after the rains. The execution of these works, under the now existing restrictions, has been suspended.

Nos. 22, 23, 24, and 25 in Statement 3 of Budget for 1857-58.

9. The new Hospital at Poorundhur has been built by contract, and was nearly completed on the 30th April 1857 (para. 13). Mr. Gerrard's report is followed by a list of works in progress or completed in 1856-57, showing the expenditure on each, (not during the official year, as it should have done, but from its commencement,) badly arranged, and in great part composed of petty works which it was quite unnecessary to particularise. One work of some importance is, I observe, included in the list, though not otherwise noticed in Mr. Gerrard's report, namely, the construction of the Kurra Ghaut between Sungumnair and Nandoor on the Poona and Nassik line with twenty-eight drains, which was completed during the past official year, at a cost of Rs. 5,503. This portion of the road, 11 miles 2 furlongs, has

still two miles unmade at the Nandoor end, and a part of the Chundunpooree Ghaut is also incomplete; but the sanctioned estimates are exhausted, and supplementary estimates (not for these portions merely but for the entire completion of this line of road) are required, and have long since been called for from this Office.

10. No mention is made by Mr. Gerrard of the occupation or conduct of his subordinates during the past official year, and the report, though the third I believe which has been prepared, is still defective and unsatisfactory.

I have the honour to be,
My Lord,
Your Lordship's most obedient Servant,
C. WADDINGTON, Major General,
Chief Engineer of Public Works.

POONA AND KIRKEE CANTONMENTS.

No. 1173 of 1857.

Public Works Department.

Executive Engineer's Office, Poona, 3rd July 1857.

To the Superintending Engineer Central Province.

Sir,—In reply to your Memo. No. 3178, dated 28th ultimo, requesting that the yearly report called for by Government in their Circular No. 1806, dated 27th November 1855, communicated under Chief Engineer of Public Works' No. 12731, 19th December 1855, may be transmitted to you without delay; I have the honour to observe, that the principal work in progress in this Department is the new European Barracks at Poona, and that owing to the Contractors having failed, the work has been suspended since the 18th September 1856.

2. The only other rather large work that has been going on during the last year, is the married men's quarters to the European Barracks at Ghorpuree, and they have been considerably advanced, and the work has been well executed.

3. On the breaking out of the war with Persia, two of the European Overseers, experienced men, were sent with the Force, and their places have been filled up by men just arrived from England, who know nothing of the language and are unfitted as yet to be entrusted with the superintendence of large works.

4. The expenditure in the Department, during the past year, as compared with the average of that for the last five years, is as Rs. 1,42,097 to Rs. 89,457.

5. All the works that have been carried out have succeeded, and none have failed, with the exception of a kutcha-built filth-burning kiln, built as an experiment, and which tumbled down.

6. Mr. Coke joined this Department as an Assistant under date 11th February 1857, and is employed in looking after the works. Serjeant Hayward, who has been in the Department for a number of

years, is the principal Overseer of the works at Poona, and understands his duty thoroughly, and is an excellent Overseer, exactly suited for the superintendence of work at a large Military station. Serjeant Roberts had charge of the works at Kirkee; he was a good man, but without any experience of work in the Deccan, and he has lately gone to England.

7. Since the European Overseers went to Persia, most of the works have been under the superintendence of Native Surveyors, and they have done their work very well. Being a little inexperienced in the execution of works, they require a little looking after at first, and I am not prepared to say that they are altogether fitted for the entire superintendence of large works, such as upper-storied European Barracks, but they are excellent men, and I could find employment for a much larger number than I have at present.

8. The Railway operates at present greatly against the execution of large works at Poona, as the work-people and artificers are snatched up by the Contractors, and the greatest difficulty occurs at times in getting people of any sort to work; and, until the Railway is finished up to Sholapoor, there will be more or less difficulty in carrying on large works at Poona as expeditiously as they ought to be. In the end, however, this existing evil will be rectified, and there is no doubt that an immense number more of artificers and work-people will then be available for the public works than there were before.

9. All the works nearly in this Department are done by contract, and there are a few very good men as Contractors, though not of large means; but owing to the Barracks having been suspended, and to one of the largest Contractors having thrown up his contract and forfeited his deposit to a large amount, there is not, I am sorry to say, that confidence in the contract system on the part of Contractors which it is so desirable to instil into this class of persons, and until this confidence is restored, which will take a little time to effect, and other Contractors of capital come forward to carry out the Government works, the works will not progress as rapidly as they might do. The contract system cannot, in my opinion, be too much encouraged, though not on Major Crawford's plan, which I object to altogether.

10. In conclusion, I beg to report, in accordance with the request contained in your Circular No. 2236, dated 8th April 1857, that no white ants have been destroyed in this Department during the last year, and I have no remarks to make on the subject.

I have the honour to be,
Sir,
Your most obedient Servant,
W. D. GRAHAM, Captain,
Acting Executive Engineer, Poona and Kirkee.

No. 3371 of 1857.

PUBLIC WORKS DEPARTMENT.

Superintending Engineer's Office, Central Province, Poona, 6th June 1857.

Transmitted to the Chief Engineer of Public Works, with reference to Memo. No. 2667, from the Assistant to the Chief Engineer, dated 19th May 1857.

C. W. TREMENHEERE, Major,
Acting Superintending Engineer, Central Province.

No. 3925 of 1857.

PUBLIC WORKS DEPARTMENT.

Office of Chief Engineer of Public Works, Bombay, 24th July 1857.

To the Right Honorable LORD ELPHINSTONE, G.C.H.,
Governor and President in Council.

MY LORD,—As required by the 5th para. of the Government Resolution under Mr. Secretary Hart's Memo. No. 1806, of 27th November 1855, I have the honour to submit a report, No. 1173, dated 3rd June

1857, by Captain Graham, Acting Executive Engineer Poona and Kirkee, of the operations of his Department during the year 1856-57.

2. Captain Graham's report is so brief, that it scarcely calls for remark. It is vague and general in its description of works executed, and not much information can be gained from it on that subject. I am glad to observe that he reports favourably of both his European and Native subordinates. Of Serjeant Hayward he writes, that he "understands his duties thoroughly, and is an excellent Overseer, exactly suited for the superintendence of work at a large Military station," and of Serjeant Roberts, that "he was a good man." Serjeant Roberts has gone sick to England.

3. The expenditure of 1856-57, as compared with the average expenditure of the previous five years, is stated by Captain Graham to have been as Rs. 1,42,097 to Rs. 89,457, showing a considerable increase; but the works at Poona and Kirkee, under Major Margary, proceeded, as is known to your Lordship in Council, with remarkable deliberation, so that the expenditure of that Officer is not a fair criterion. Allowance must be made since 1854-55 for the competition of the Railway causing great scarcity of artificers.

I have the honour to be,

My Lord,

Your Lordship's most obedient Servant,

C. WADDINGTON, Major General,

Chief Engineer of Public Works.

LIBRARY OF THE BOMBAY BRANCH OF THE ROYAL ASIATIC SOCIETY

TANNA.

No. 1227 of 1857.

Public Works Department.

Executive Engineer's Office, Tanna Collectorate,
Bandora, 31st July 1857.

To the Superintending Engineer Central Province.

Sir,—I have the honour, agreeably to instructions received in your Office Memo. No. 6112, dated 26th December 1855, and accompaniment, paras. 4, 5, and 6 of Government Resolution No. 1806, dated 27th November 1855, to forward herewith a detailed report of the principal works performed in the Tanna Collectorate during the year 1856-57, with a Sketch Map annexed, on which all the places mentioned in the report have been clearly marked.

Statement No. 1, *Budget of* 1856-57, *Public Works Department.*

1. *Constructing a new Line of Road from Khurdee to Wassind, including Bridging, Draining, and Metalling.*

Nearly twelve miles of this road have been cleared between Shapoor and Khurdee. The excavation of the southern abutment, and the pier next to it, of the Shapoor Bridge, is in progress; the commencement of the other portions of the work has been delayed on account of the non-receipt of the plans. There was fortunately a trace of the Shapoor Bridge in the office, otherwise that work could not have been commenced. Every endeavour will be made to complete the road to such an extent, by the monsoon of 1858, as at any rate to admit of the safe and speedy transit of the mails. It would be, I think, injudicious to open the line for general traffic until after the monsoon, as the earth-work of no road can be considered to have bound properly until it has at least been exposed to the effect of one monsoon.

This work is under the immediate superintendence of Lieutenant Browne, Engineers.

2. *Metalling the Road from Wassind to Colsette Bunder, including Clearing and Levelling.*

Suspended, as per Government Resolution No. 2056, dated 26th August 1856, as it has been decided to make a new line between Wassind and Colsette Bunder including the branch to Kusselee Bunder. Accordingly the requisite survey is in progress, and the levels are being taken by Lieutenant Browne, and it is expected that the project will be prepared and submitted for sanction in time for insertion in the Budget of 1858-59.

Statement No. 2, Budget of 1856-57, *Public Works Department.*

4. *Fair-weather Road from Mahar to the foot of the Wurrundur Ghaut.*

This road connects Mahar and the Wurrundur Ghaut, which is under the Executive Engineer Sattara Collectorate, and I believe is nearly completed, although not yet open for traffic. This road was commenced in December 1855, and the whole of the earth-work has been completed, with the exception of some very heavy side-cutting. Along the banks of the Kal River, near Beervaree, for a distance of about three-quarters of a mile the earth-work has been made complete for bridges and drains, with the exception of at the Savitree River, where a very large bridge, with high embanked approaches on one bank, will be requisite. In order that the road may be opened as a fair-weather communication after the monsoon of 1857, side roads have been made at the sites of all bridges and large drains, and dips at the sites of the smaller drains. The length of this road is 8 miles 6 furlongs and 339 feet, and the breadth at surface 24 feet. The insufficiency of the sanctioned amount for completing the line as originally contemplated has been duly reported, and instructions have been received for the submission of a supplementary estimate, which is in course of preparation. An estimate has also been called for, for bridging, draining, and kerbing the line throughout, which will most probably be submitted in time for insertion in the next Budget. This work is under my own immediate superintendence.

54. *Road from the old Bridge at Nagotna to the Main Line on the South side of the River.*

This project, which was proposed by Captain Graham, has been abandoned, it having been decided as preferable to build a bridge a little below the present ford on the existing line from Nagotna to Mahableshwur.

56. *Raised and Bridged Road from Panwell to Pursik.*

This road was originally proposed to connect Bombay and Poona by a road, in order to avoid the necessity of crossing the harbour. The postponement of the construction of this road has been unavoidable, as Mr. Scott's estimate afforded no details; it was therefore requisite that a survey should be instituted and the requisite levels taken. Mr. Robins was appointed to that duty in November last, and that gentleman has completed the survey, taken the levels, and submitted an estimate for the first half of the line, viz. from Pursik to Tulloja. The estimate was, however, returned by the Superintending Engineer, in order that barrel drains might be substituted for slab drains that required a foundation right across, and also that a saving in a heavy cutting might be effected by making the gradients steeper than originally proposed. These alterations will not, it is imagined, reduced the estimate to any great extent. Mr. Robins has not yet submitted the revised estimate. The estimate for the remaining half, Mr. Robins says he will be able to submit during the ensuing monsoon.

In my letter No. 221, dated 17th February 1857, handing in the estimate for the portion between Pursik and Tulloja, I wrote as follows (paras. 3 and 4):—

"3. From the accompanying sketch map it will be seen, that before "the introduction of the Railway, when I believe the construction of the "road was strongly advocated by Captain Graham, that a road between "the places abovementioned was not only advisable but most urgently "required, in order to connect Bombay and the Deccan by a road, "without the necessity of crossing the harbour. With this view the "road from the Tanna River was made by Mr. Scott, as far as Pursik "on the Railway, a distance I believe of about four miles.

"4. I have been a long time forming the opinion, but I now feel "perfectly certain, that if the road were made, there would be no "traffic upon it, the extremities of the line being Railway Stations; "and even supposing traffic to continue as it does at present between "Khapoolee and Panwell, natives, I am confident, would prefer "sending their goods to and fro across from the Panwell Bunder in "one night, to making a two-days' land journey of twenty-four miles "a day *viâ* Tanna. The only advantage derived from the road would "be the transit of gentlemen's horses, which have now no difficulty "in finding their way along in the dry season, and in the rains even "can get along easily on the top of the rice bunds. I trust Government "will understand that I do not wish to oppose the execution of the "project if they see the advantages of it. I must, however, say that "I do not; and beg with all due deference to state also, that I consider "that the sum of Rs. 83,140, for making the road half way, will be "entirely sunk, as far as the interests of Government are concerned. "Independent of that, it will take as much, if not more, on account "of the bridging being more extensive, to complete the line to Panwell; "and if the road is made to Tulloja, it must be carried on to Panwell "to be of any use at all."

57. *Raised and Bridged Road from Capoor Veer to Chiney Khind.*

Last year only about three miles of filling and cutting were completed, as there was no Assistant in charge to superintend the work. This year the earth-work has been completed up to the end of the fourth mile to a width at surface of twenty-four feet, one mile of kerbing has been laid, and kerbstones for about two and a half miles collected. The sanctioned amount is all but expended; the work is therefore all but stopped. The insufficiency of the estimate has been duly reported, and Mr. Robins has been directed to prepare and submit a supplementary estimate, but it has not yet been received. Mr. Robins has also been requested to mark out the line as far as Ghorebunder, and submit an estimate for the same during the ensuing monsoon if possible. The length of the road up to Chiney Khind is about five miles.

This work has been superintended at different times by Lieutenant Cotgrave, Engineers; Lieutenant Dickens, 64th Queen's Regiment; Lieutenant Henry, 86th Queen's Regiment; Lieutenant Browne, Engineers; and Mr. Robins, who has held charge since February last.

82. *A Well at Wuruscoal.*

This well is now completed, with the exception of a portion of the parapet walls and the pavement, which has been delayed for want of stone-cutters. The well is twenty-two feet deep. The masonry walls are carried down to the rock, which was found sixteen feet below the surface, instead of at twelve feet as supposed by Captain Scott, who framed the original estimate. It was therefore found necessary to submit a supplementary estimate, amounting to Rs. 325, for sanction. The site of this well has been most judiciously selected. This hot season the water never ran lower than four feet; it affords the chief supply to travellers along the road near Khurdee, in the neighbourhood of which the supply of water at this season is scanty in the extreme. The nature of this work would only admit of its progressing at certain seasons of the year. The work will be completed this season.

This work has been, while actually under construction, superintended by the following Officers:—Lieutenants Cotgrave and Browne, Engineers, the latter of whom is now in charge.

83. *Two Wells at Rurtoonda.*

The necessity of sinking these two wells along the Bombay and Agra Road arose from the scarcity of water prevalent during the hot months. These wells are now respectively fifteen and eight feet deep; the depth blasted through this year being five feet. In consequence of both these wells being below the surface of the water in the Rurtoonda Valley, and one actually being situated within the pond dammed up by the Bundara at this place, great difficulty is experienced in carrying on these works on account of the percolation being so constant; the work can only proceed in the months of April and May, which accounts for the small progress made. It is to be hoped that these wells will be completed next hot weather.

These wells have been at different times, while actually under construction, under the immediate superintendence of Lieutenant Cotgrave, Engineers; Lieutenant Dickens, 64th Queen's Regiment; and Lieutenant Browne, Engineers; the latter of whom is now in charge.

112. *Extraordinary Repairs to six miles of the Mail Road from Panwell to Khapoolee.*

On account of the severe indisposition of the only man I had available to carry on this work, I was unable to commence breaking metal until January last, since which time every endeavour has been made to get the requisite quantity of metal prepared by the monsoon, but without success, on account of the immediate vicinity of the Railway works on the Bhore Ghaut, where an immense number of labourers are constantly employed. Biggaries who can get other employment object to breaking metal, as it is more laborious than earth-work, to which they are accustomed. I have every dependance on the man in charge; he is a pensioned Sapper, by name Shaik Sumsoodin, and always bore a most excellent character when with the Sappers, and I have invariably found him a most valuable man. I mention this in order to show that I had good reasons for not entrusting the preparation of the metal to any one I could get, during the first two months of the working season when Shaik Sumsoodin was ill. The success of a work of this kind depends entirely on the good quality of the metal; it does not do therefore to entrust such work to any body: more cheating takes place in the preparation of metal than in any other description of work. I expect that only sufficient metal will be prepared by the monsoon for carrying out two miles of the extraordinary repairs, which consists of putting on a five-inch layer of metal over twenty feet in width of the road. Kerbing is being laid where none exists, and a portion of the road, for 501 feet, has been raised two feet near Chouk. Over the portion of the six miles on which the extraordinary repairs cannot be carried out this monsoon, measures have been taken to provide sufficient metal for carrying out ordinary repairs and keeping the road in good order.

The portion on which the extraordinary repairs will be executed

this monsoon is the worst part of the line ; in fact the only part that ever really gets into bad order during the monsoon.

121. *Deepening a Well at Atgaum.*

This well has been deepened four feet, and it now affords a constant supply. I therefore have issued directions to discontinue deepening it any further, since such can only be done by constantly baling out the water, which would otherwise be available for the use of travellers on the road. Another reason for not rendering it advisable to go to the expense of deepening it any further, is that the new road, which leaves the old road entirely, has been commenced, and will probably be opened next year, when the well will no longer be used by travellers, but only by the inhabitants of the neighbouring villages. The deepening of this well was sanctioned solely for the benefit of travellers on the road.

This work, while actually under construction, has been at different times superintended by the following Officers:—Lieutenant Cotgrave, Engineers; Lieutenant Dickens, 64th Queen's Regiment; Lieutenant Browne, Engineers; the latter of whom has now charge of the work.

123. *Deepening a Well at Kussara.*

This well was sanctioned to be deepened about four feet, for the benefit of travellers on the Agra Road, and will be completed this season it is imagined.

This work has been superintended by Lieutenant Cotgrave, Engineers; Lieutenant Dickens, 64th Queen's Regiment; and Lieutenant Browne, Engineers, who has now charge of the work.

Statement No. 2 of Budget of 1855-56, *Public Works Department.*

104. *New line of Road to avoid a steep ascent near Shapoor between Shapoor and Khurdee.*

Completed on the 30th June 1856. A short description of this work has been given in the last report, for 1855-56; a repetition is therefore unnecessary.

106. *A Dam at Mokhana.*

The necessity of the construction of a dam across the Mokhana Valley has been already noticed in my report of last year. In April

1856, Colonel Scott, the Superintending Engineer, inspected the work, and brought to my notice, in the month of May, that a strong spring had been met with in the principal excavation, and that it was useless continuing the work. It will be seen from my former report, that I laid great stress on the necessity of the foundation trenches being inspected by some Officer before the foundations were laid, and it is as well that I thus determined, otherwise more money would have been uselessly expended on the old site. It must be remembered that I had at that time no Assistant in charge. A correspondence ensued on the Superintending Engineer's bringing to my notice the existence of the spring, which resulted in my views being adopted, viz. of selecting a new site, below the former one, so as to enclose the spring and adding a sluice to the work.

In December last I directed Lieutenant Browne, Engineers, who had lately joined me, to select a fresh site, and he accordingly did so, and I approved of the selection. I also directed him, in drawing up the fresh designs, to adopt certain modifications, which were as follows:—

1st. Building the weir twenty-one feet instead of twenty feet, that being the difference of level of the bed of the valley in the deepest part between the old and new sites. It is evident, that if this had not been done, the water would not have been dammed up to the same extent as was intended by Lieutenant Scott, Engineers.

2nd. Building masonry wings to a height of twelve feet. The necessity for building the wings this height was ascertained by taking a longitudinal section of the bed for half a mile above and below the site, with three cross sections, one above, one at, and one below the site. From this data the mean velocity was calculated from DuBuat's formula, and the discharge obtained; whence the depth of overflow due to a length of 120 feet, the greatest length of weir that could be given, was calculated by Neville's well-known formula and found to be about ten feet.

3rd. A sluice of six feet span with a semi-circular arch on abutments three feet high; to be provided with a gate 6′ 9″ × 6′ 9″, made of 3″ teakwood planks laid longitudinally, and strongly bound in three places with bar iron, and provided with the requisite appurtenances in

the way of iron rings, &c., and the side against the masonry to have a leathern belt nailed on all round to make the sluice water-tight; also to be provided with a chain rope and system of pulleys for the purpose of hoisting; the gate to work in grooves of cut stone. The advisability of adopting this modification was treated of at length in my report of last year; suffice it to say now, that its use is to admit of the refuse water, dirt, and filth being scoured out by the first rush of the water in the monsoon, and thus ensure a supply of pure water, and obviate most effectually the cause of failure of all solid Bundaras.

4th. On account of the nature of the ground at the new site, it was found absolutely necessary to prolong the masonry dam by an earthen one, five feet thick at top, and having slopes on either side of 1 to 1, with a puddle wall three feet thick built up from the rock. This plan was adopted as being cheaper than continuing the masonry wing on the same side.

This dam was commenced on the 1st January 1857, and it is nearly completed. The masonry portion is 168 feet long, and the discharge weir, which is 120 feet long, is twenty-one feet in height at the centre of the valley; the weir at pavement is seven feet wide, interior side being perpendicular and the exterior having a batter of $\frac{1}{3}$. Each masonry wing is twelve feet high above the pavement of the weir. The sluice on the inner face is provided with cut stone pillars fifteen feet high, with grooves cut therein for the working of the gate, which, when hoisted up, will remain suspended clear of the sluice. In order to ensure the dam being perfectly water-tight, an earthen backing (which is the fifth modification), three feet thick at the level of the pavement, and with a slope of 1 to 1, is to be erected against the masonry; it is now half up. The length of puddle dam in prolongation of one of the masonry wings is eighty feet, and it is now seven feet high. It is confidently expected that this work will be completed by the monsoon. A supplementary estimate for Rs. 3,049 has been submitted for this work.

This work is under the superintendence of Lieutenant Browne, Engineers.

106. *A Cistern below the Khurdèe Tank.*

This work was stopped by Colonel Scott when he visited it in April 1856, and he wrote to me and told me that on account of the rock being found so much nearer the surface than was anticipated by Captain Scott, that his design could not be carried out. At that time there was no Assistant in charge; nothing could therefore be done towards ascertaining the best method of building the cistern before last monsoon. The excavation was recommenced this season, in January, by Lieutenant Browne, and when Colonel Scott inspected the work in February last, he gave the following instructions, which have been carried out:—

The north and south sides to be pitched with dry rubble, the former to a slope of $\frac{1}{2}$ to 1, and the latter, on account of the greater pressure to be sustained, to a slope of $1\frac{1}{2}$ to 1. Behind the northern pitching there is a puddle wall three feet in thickness, and of a height equal to the depth of the cistern, viz. twenty-eight feet; its object being to prevent the escape of the water in that direction by percolation. On the east and west sides, where the rock is within six feet of the surface, masonry walls to be built 1′ 6″ thick at top, perpendicular at the rear, and with a batter of $\frac{1}{5}$ in front.

All these instructions have been carried out, but it was found requisite to break the pitching on the southern side into steps, as a slope of $1\frac{1}{2}$ to 1 was found to be too steep for the easy ingress and egress of the inhabitants.

This cistern is fed by the percolation of the water from a tank close by, through the dry rubble steps on the southern side; hence the reason why this was not made water-tight, similar to the northern side. There is also a spring in the cistern.

The width of the excavation at the top is fifty feet; rock, as mentioned above, appearing within six feet of the surface, being on the west side basalt, and on the east side trap, gradually narrowing towards the bottom, where there is only fifteen feet between the rock sides. Nothing but earth was found at the bottom of the cistern when excavated to the required depth. The whole of the work has been completed, with the exception of the parapet walls and the side

channel for turning off the waste water of the tank, which has to be blasted entirely out of the solid rock; the latter work is, however, nearing completion, and it is to be hoped the parapet walls will also be completed by the monsoon.

This work is under the immediate superintendence of Lieutenant Browne, Engineers.

106. *Increasing the height of the Rurtoonda Dam.*

This Bundara was raised to the contemplated height provided for in Captain Scott's estimate, and completed in the month of May 1856. After the monsoon it appears that the Bundara leaked, and that the fact was known to the Kolwun Mamlutdar, who failed to bring the same to my notice immediately, as he ought to have done; and it was not until after Lieutenant Browne had joined me that I became acquainted with the fact. I could, however, issue no instructions to remedy the evil until I had an opportunity of inspecting the work, which was not until February last, when I issued the following instructions to Lieutenant Browne in person, namely, that the pavement, which was considerably loosened, must be taken off and refixed, and a portion of the weir taken down and rebuilt; also that the masonry wings must be raised, to effect which, in order to obtain the proper batter, the old wings must be taken down and almost entirely rebuilt; also that the banks of the valley, where scoured out by the overtopping of the old wings, must be pitched with dry rubble; the old plaster to the rear of the wall to be knocked off, and the wall to be repointed and backed with an earthen slope of 1 to 1. This latter slope, in the first instance, to be only partially made, so as to answer the purpose of a dam, to separate the mass of water from that immediately in rear of the wall, which, when baled out, would leave the bare wall exposed to view, and thus enable us to become acquainted with the position of the leaks. It is evident that by adopting this means, no extra expense, on account of a dam for the purpose of baling out the water, would be incurred. As it is impossible to tell what quantity of masonry would have to be taken down, no supplementary estimate has as yet been sent in; one will, however, be submitted shortly.

Detailed calculations were instituted in order to determine the height it would be requisite to raise the wings, as it is evident that when the wings were raised clear of the floods that the latter would rise higher than formerly. Seeing that the length allotted to the overflow would be curtailed, the discharge due to the rise of the highest floods, the height of which was clearly defined by the scouring of the banks of the valley, was considered as three separate discharges, viz. over the centre portion or weir and over each wing, and calculated according to Neville's formula. The sum of the three discharges thus obtained, was of course the whole discharge for which provision was requisite. According to the same formula, therefore, the depth of overflow was easily calculated, the length of the weir being given. The calculated overflow was about ten feet; the wings have therefore been raised seven feet, they having been built only five feet above the weir, according to Captain Scott's design. This dam is an instance of the cause of failure of dams in general which are not provided with a sluice. When this dam was first built, its height above the bed of the stream was sixteen feet, but now it is only nine feet, thus proving that a deposit to the rear of the dam of a depth of seven feet has already taken place; this will gradually increase in depth until the space to the rear of the weir is entirely filled up, when the dam will become useless, unless this deposit is removed. To obviate an occurrence of the kind, and also to get rid of the existing deposit, I have decided on recommending for sanction a very simple remedy, viz. that of tunnelling a sluice through the wall. I shall call therefore upon Lieutenant Browne to furnish an estimate of the probable expense. Independent of such a mass of deposit behind a dam depriving us of an equal quantity of water, it sadly deteriorates the quality of the water dammed up, and, in the case in point, the water is now so filthy, that animals even cannot drink it.

This work is under the immediate superintendence of Lieutenant Browne, Engineers.

108. *Bridge over the Barrogaum River.*

This bridge was most fully described in my last report, as also the

great difficulties attending its construction, consequent on the paucity of work-people, owing to the immediate vicinity of extensive Railway works. These difficulties were, however, at length successfully overcome, and the bridge was opened for traffic on the 30th September 1856, and finally completed on the 2nd December 1856. A supplementary estimate, amounting to Rs. 4,243, was submitted, and sanctioned. A further excess of Rs. 70-4-11 was, however, incurred; the excess over the original sanctioned amount, Rs. 4,313-4-11, was caused by the rising of the prices of labour and materials during the interim that elapsed between the framing of the estimate and the execution of the work.

Serjeant Cheetham had charge of this work, under the immediate superintendence of myself.

109. *Four Causeways or Culverts on the Mail Road from Panwell to Khapoolee.*

These culverts (more correctly termed small bridges) were completed last season, with the exception of consolidating the metal on the surface of three of them, which work could not be executed until last monsoon. With the exception of one near Khapoolee, which was opened to the public on the 8th July 1855 in an unfinished state, the others were opened at the commencement of last monsoon; it was not considered advisable to open them before, since the surface material, viz. metal, was in an unconsolidated state, whereas the side roads were in most beautiful order. These works were most fully described in my last report, as also the difficulties attending their construction, consequent on the immediate vicinity of extensive Railway works and the paucity of work-people; any further description of them is therefore superfluous. Suffice it to say that the original estimate was exceeded by Rs. 4,015-15-6, the rates of labour and materials having risen considerably since the time the estimate was framed.

112. *Extension of the Khapoolee and Penn Road to Wasee, and Kerbing the same.*

This road was opened for traffic after the monsoon, complete in every respect as originally designed. Since that time I obtained a

sanction for kerbing the road, and gave the same in contract; the work is half done, and will be completed this season, probably before the end of July or August, if the rains are not so heavy as constantly to stop the work. The object of this road was fully described in my last report, as also the advisability of prolonging it to the confluence of the Penn and Nagotna Rivers. I laid this proposal before the Commissioner of Customs and the Sub-Collector, and both these gentlemen have expressed their entire concurrence in my views; accordingly I have made arrangements to proceed and mark out the line and take the levels before the setting in of the monsoon, and the plans and estimate, it is to be hoped, will be submitted in time for insertion in the Budget of 1858-59.

The original sanctioned amount, Rs. 9,998, would not suffice for the construction of this line as contemplated; a supplementary estimate was therefore submitted, amounting to Rs. 3,445.

Under the immediate superintendence of myself.

114. *Dry Stone Parapet Walls on the Parr Ghaut.*

Described in last report; completed on 10th May 1856, under the immediate superintendence of myself.

115. *Improvement of the Road over the Dasgaum Khind.*

Fully described in last report; completed on 10th June 1856, under the immediate superintendence of myself.

116. *Bath-rooms and Necessaries to the Travellers' Bungalow at Poladpoor.*

These bath-rooms, on account of the dilatoriness of the Maistree, were not completed until 12th January 1857. As last season both my Assistants were removed, I was obliged to place implicit confidence in the Maistree, who had formerly given great satisfaction, since I had no time to attend to such a simple work in such an out-of-the-way situation. The original sanctioned amount has been exceeded by Rs. 280-10-7.

Under the immediate superintendence of myself.

120. *Removing the Obstructions in the Channel of the Tanna River.*

The nature of, and advantages attending this work, were described in my last report. The work will be finally completed in a few more days. Under the immediate superintendence, at different times, of the following Officers :—Lieutenant Cotgrave, Engineers ; Lieutenant Dickens, 64th Queen's Regiment; and Mr. Robins, Sub-Assistant Executive Engineer, who is at present in charge.

124. *Sinking a Well in the Compound of the Travellers' Bungalow at Bassein.*

This well, the object of sinking which was mentioned in my last report, was completed on 17th May 1856. It is twelve feet in diameter and fourteen feet deep, excavated in sand, supported by a burnt-brick and choonam wall, finished off with a parapet wall of similar construction and plastered with choonam ; a brick pavement, two feet in width, surrounds the parapet. Under the immediate superintendence, at different times, of Lieutenant Cotgrave, Engineers, and Lieutenant Dickens, 64th Queen's Regiment.

Constructing a new Road from Kolad to Roha Bunder, and Draining the same.

The earth-work of this line is entirely completed, and the culverts and drains are being built by contract. Nine are completed, and the remainder are in progress; the drains will be completed, it is calculated, before the monsoon. Some months ago I urged strongly the necessity of kerbing this line, but as yet no sanction has been received. A masonry Bunder in connection with this road has been sanctioned, and lately commenced. The object and use of this road was mentioned in my last report. There is one small river on this line which at present it has been considered unnecessary to go to the expense of bridging, as there is an easy ford across it; when the several large rivers on the road to Mahar, part of the same line, have been bridged, it will then be time enough to take the bridging of this small river, which offers comparatively speaking so little obstruction, into

consideration. This road is about seven miles in length and twenty-four feet in breadth at the surface. The original sanctioned amount of Rs. 6,401 would not nearly suffice; accordingly a supplementary estimate, amounting to Rs. 10,889, was submitted, and sanctioned. The original estimate was drawn up on a mileage rate, which was a system very much in force at the time. Under the immediate superintendence of myself.

Constructing a new Road from Poniar to Nagotna River, and Kerbing the same.

This road, as originally designed, was completed and opened to the public at the end of last monsoon. The original estimate sanctioned not sufficing, being under-rated considerably, a supplementary estimate of Rs. 6,915 was submitted, and sanctioned. The kerbing of this line has lately been sanctioned on my recommendation, and is now in progress by contract.

A prolongation of this road to Alibaug on the Coast has been marked out and surveyed, and all the levels taken, and the designs, ten in number, all drawn; and the estimate will be shortly submitted for sanction. The length of the portion made as far as Poniar is 13,385 feet. Under the immediate superintendence of myself.

Constructing a new Road through the Town of Bassein.

This road was noticed in my last report; it was completed last year, but the submission of the final bill was delayed on account of the amount of compensation due to certain landholders being unsettled by the Collector. The length of this road is 1 mile 6 furlongs and about 116 feet. Under the immediate superintendence of Mr. Scott, and of Lieutenant Cotgrave, Engineers, while actually under construction.

Adding Teapoys, Shelves, and Pegs to the Travellers' Bungalows in the Collectorate.

Seventy-three shelves with six pegs under each, and fifty-eight blackwood teapoys, were supplied. The shelves were four feet long

and one foot in breadth, supported on three brackets; they were made of good teak and varnished with English varnish.

Draining the Masoonda Tank and building two Timber Crossings over the Waste Channel.

The clearing of this large tank and removing the weeds of the growth of years, was proposed by Colonel Scott, who obtained a sanction of Rs. 500 for the work. Intimation of the sanction was not received, unfortunately, until the commencement of the monsoon, hence the reason why the tank did not fill properly after the completion of the work. Before the weeds could be removed, it was necessary to cut open a waste channel to turn off the water; this was accordingly done, and, when the tank was clear, an earthen dam was erected across its mouth, in order to dam up a fresh supply. By the time this amount of work was done there was a considerable excess, but the nature of the work would not admit of its being stopped until the earthen dam was completed; it was then stopped, and a supplementary estimate submitted, with two designs by Lieutenant Henry, 86th Queen's Regiment, for two timber crossings for foot passengers and cattle; one in a line of the embankment around the tank and near the earthen dam, and the other in order to afford a safe passage for the inhabitants of the neighbourhood to a well across the channel. As the waste channel was close to the kerbing of the main road to the Station, it was requisite for the safety of man and beast to erect a railing of some kind; and one consisting of posts, connected by a chain at the top, was decided upon. This work was stopped by order of the Chief Engineer as soon as the excess was reported, hence the reason why it is not completed this season: however, sanction has lately been given to proceed with the work, and it will be, I hope, completed by the monsoon. Mr. Robins has brought to my notice that some liberal Bombay Native has lately sunk a well, twenty feet square and twenty feet deep, in this tank; the Collector has also lately called upon me, through the Chief Engineer, for an estimate of a well in this tank. The amount of the supplementary estimate is Rs. 1,115. Under the immediate

superintendence at different times of Lieutenant Dickens, 64th Queen's Regiment; Lieutenant Henry, 86th Queen's Regiment; and Mr. Robins, who is now in charge.

Constructing the 2nd and 3rd Divisions of the new Line of Road between Khurdee and Kussara.

A full description of this road was given in my last report, and the work then remaining to be done has since been all but completed. The work executed this season is as follows:—Coping to parapet walls, caps to wings and piers, of the Mokhana Viaduct; caps to piers of the Oomermalee Bridge is in progress; coping to parapets, cornice and caps to wing walls of the Kurumpada Bridge; and all the drains and culverts which were in an unfinished state at the close of last season have since been entirely completed. The work remaining to be done is the completion of the slopes of the approaches to the Mokhana Viaduct.

This road was designed and constructed by Captain Scott, Engineers, and it has since been under the immediate superintendence of the following Officers at different times:—Lieutenant Cotgrave, Engineers; Lieutenant Dickens, 64th Queen's Regiment; and Lieutenant Browne, Engineers, who is at present in charge.

Extraordinary Repairs to the Horse-boat plying at the Ghorebunder Ferry.

The following repairs being found requisite were executed:—The keel, gunwale, and planking to both hull and deck were partially renewed, as also the hand rail surrounding the deck; a new teak-wood rudder, oars, a new single block, a new mast, iron grapnel, leaden pipes to discharge the water from off the deck, together with a new sail of double dungaree, with coir ropes, were provided; the boat was tarred, and the mast and railing painted black. Under the immediate superintendence of Lieutenant Browne, Engineers, and Mr. Robins, Sub-Assistant Executive Engineer.

Extraordinary Repairs to the Boat plying at the Datewra Ferry.

Portions of the keel, socket for the mast, and the interior boarding renewed; the deck planking was repaired, also the ribs of the landing

boards, and the hand railing where necessary; new rudder and tillers of teak, one new wooden block, a new yard forty feet long, four oars, four poles, a new mast made of Aynee wood, iron grapnel, a double dungaree sail, and a set of coir ropes, provided; the boat was tarred.

Providing Venetian Shutters to the Travellers' Bungalows at Shapoor, Khurdee, and Kussara.

The Venetian shutters in the Khurdee Bungalow have been erected, and the others are in course of construction.

Constructing a Raft for the Colsette Ferry

The frame-work of the two boats is prepared, and about one-half of the hull planking completed.

Constructing three Rafts for Ferries in the vicinity of Tannà.

Two of these rafts have been completed, and the third is nearly ready; they consist of two strong boats, twenty-five and a half feet long, 273 feet deep, and seven and a half feet wide, joined together by a strong timber platform, railed in all round, except at the two entrances. The deck thus formed is fourteen feet long and twenty feet in breadth, the space between the boats being two feet eleven inches. The rafts are built of teakwood, and the planking of the hulls of the boats are caulked and tarred; the remainder of the wood-work being painted black.

Constructing a Bunder at Dhurumther on the Penn side of the River.

Completed on 23rd June 1856 (for description see last report), under the immediate superintendence of myself.

Constructing a Bunder at Dhurumther on the Poinar side.

Completed on 23rd June 1856 (for description see last report), under the immediate superintendence of myself.

Repairing two Rafts plying at the Colsette Ferry.

The following repairs were executed to the copper-bottomed rafts:— The teak keels, hull planking, deck planking and railing, oars, and

one rudder were repaired; one new rudder, a new yard, a mast, socket, and copper sheathing supplied; the boats were tarred.

Building a Bunder at Roha.

As mentioned in the description of the Kolad Road, this Bunder was designed in connection with the above road. The horizontal portion is forty feet long, and the sloping portion, which is 1 in 17·46, is 244½ feet long measured horizontally; under the horizontal portion, an arch of twenty feet span, with a rise of ¼, is to be built, in order to obviate as much as possible any obstruction to the floods which will be caused by the erection of the Bunder. The side supporting walls of this Bunder are to be built of dry rubble, perpendicular on the inside, with an outer face of ½ to 1, faced with roughly-cut stone set in choonam, with true joints, to a distance of six inches back from the face; the inner face of the wall being also set in choonam to a distance of eighteen inches. These walls, where they become only three feet thick, are set in choonam right through. The earthen approaches are about 260 feet long, and form part of the road, being on the same level and of an equal width at surface; the side slopes to be finished off 1 to 1 and pitched with dry rubble. This work is given in contract to the same Contractor who is building the drains on the Kolad Road, and has only lately been commenced, and the following work has been already performed:—Commencement of foundations of side walls; excavating foundations to abutments of arch, and building up the approach half its height; and a quantity of cut stone has been prepared. Under the immediate superintendence of myself.

Supplying Furniture for the Office of the Assistant Executive Engineer Tanna Collectorate, Tanna Office.

The following articles have been supplied:—

4 Blackwood chests.
1 Blackwood desk, writing, with book-case.
1 Blackwood press for records.
1 Blackwood desk without book-case.
1 Blackwood table, drawing.
2 Blackwood tables, camp.

Supplying Furniture for the Office of the Assistant Executive Engineer Tanna Collectorate, Agra Road Office.

The following articles have been supplied :—

2 Tables, blackwood.
3 Yards green cloth for tables.
4 Boxes, of blackwood.
1 Carpet.
3 Chairs.

Extending the existing Road at Nagotna to the Bunder-head.

Fully described in last report; completed on 31st October 1856, under my own immediate superintendence.

Repairing the Roof of the Travellers' Bungalow at Khurdee.

The requisite repairs were executed, which consisted in dismantling and re-erecting the roof, and substituting new timber for all that was found in a rotten condition.

Building a Dry Stone Wall round the Compound of the Travellers' Bungalow at Mahar.

This wall was built to supply the place of the old railing, which was in a dilapidated state. Length of wall erected, 480 feet.

Enclosing the Post Office at Tanna with a Ditch.

The Inspecting Postmaster originally proposed to erect a wooden railing round the compound of this building, but his proposition was objected to, on account of the expense attending it; so it was decided on surrounding the compound by a ditch and mound 531 feet in length. Under the immediate superintendence of Lieutenant Dickens, 64th Queen's Regiment.

Lighting four Lamps at the Barrogaum Bridge.

The expense attending the lighting of these lamps on the old bridge, was sanctioned until the new bridge was opened. Under my own immediate superintendence.

Rebuilding two Drains on the Road from Panwell to Oolwa.

This was rendered necessary on account of the failure of the old drains, which were undermined.

Making and Maintaining new Metalled Roads below the four Culverts on the Mail Road from Panwell to Khapoolee.

As per last report. These roads were used until the culverts were opened, on 18th July 1855 and 1st June 1856 respectively.

Constructing a Drain on the Road running through the Town of Bassein.

This drain was required in order to carry off the drainage from certain fields, the property of Messrs. Littlewood and Co. It was two feet in height by two and half feet span, covered in with slab-stones.

Emergent Repairs to the Agra Road between Khurdee and Colsette Ferry.

An unlimited sanction was given to these repairs on account of the dreadful state of the road, which has for years deteriorated, simply because the sum allowed annually for its repairs was not sufficient to keep it in proper order, with the tremendous and constant traffic. The principal fault to be found with the road was the constant working up, to the surface, of large stones, which had been thrown in, it is presumed, when the road was first made; such being the erroneous system prevalent at the time. These have now in a great measure been removed, although a great deal remains to be done; in fact, if the road is be kept passable, gangs of labourers must be kept constantly at work. The new line between Khurdee and Wassind has been sanctioned and lately commenced, and it is expected that the same will be completed and opened for general traffic after the monsoon of 1858. Government have also called for plans and estimate for a new line as far as the Colsette Ferry, and Lieutenant Browne is now engaged marking out the line, and the project, it is hoped, will be ready for submission in time for insertion in the Budget of 1858-59. These repairs will be brought to a close at the end of May, and from

the 1st June the amount entered in the ordinary repairs estimate for 1857-58, viz. Rs. 450 per mile, will come into operation; and I have directed Lieutenant Browne to use his utmost endeavours to try and reduce the road to its proper convexity; it is at present very concave, although such an immense quantity of moorum has been thrown on this past season. This next season, I trust, will be the last during which repairs will be required to the portion of the old road between Khurdee and Wassind. Extensive repairs must continue, however, to be executed to the portion between Wassind and the Colsette Ferry, including the branch to the Kusselee Bunder, until the new line between those places is sanctioned and completed; such constant repairs are really necessary to render it passable for country carts. Under the immediate superintendence of Lieutenant Dickens, 64th Queen's Regiment, and Lieutenant Browne, Engineers, who is at present in charge.

Emergent Repairs to the Road between Coorla and Vehar.

This road forms part of the old road to Tanna, and was formerly repaired with metal; such was, however, it appears, discontinued as soon as the new road from Coorla was opened to the public, and an allowance of Rs. 75 per mile annually granted for its maintenance, which sum of course only would admit of moorum being used. As soon as the construction of the Vehar Lake was decided upon and commenced, Lieutenant Henry brought to my notice that he was afraid the road would not stand the traffic of the iron castings, and recommended that the road should be metalled; in the mean time the Chief Engineer sanctioned any emergent repairs that might be considered necessary to keep the road free from hollows and ruts, &c.; and this work is being carried on until the metal recently sanctioned can be prepared and spread on the road. Under the immediate superintendence of Mr. Robins, Sub-Assistant Executive Engineer Tanna Collectorate.

Surveying the proposed new Line of Road between Wassind and Colsette Ferry, and the Branch Road to the Kusselee Bunder.

Lieutenant Browne, Engineers, my Assistant, is now engaged taking

the requisite levels, and if such can be completed by the monsoon, I confidently hope that the requisite plans and estimate may be ready for insertion in the next Budget.

Surveying the proposed new Line of Road between Khapoolee and Dhurumther viâ Penn.

This survey was prosecuted last season, and the levels taken last season by myself. The requisite plans and estimate were duly submitted for sanction last October, but Government objected to enter the work in the Budget of 1857-58 on account of the contemplated expense, which amounted to Rs. 3,61,008. A proposal will, however, be shortly made to Government to sanction the construction of the first six miles from Dhurumther in the first instance. This road is very much needed on account of the existing fair-weather road being impassable in the monsoon for the want of bridges and drains. The Sub-Collector has stated his acquiescence in my views on this subject. By a reference to the Map, it will be seen that this road will open out all the country in the direction of the Coast to the Railway. It need hardly be remarked that others have been marked out in connection with this line, viz. from Dhurumther to Nagotna, and from Poinar to Alibaug; the construction of these roads is requisite in order to complete the communication of the southern portion of this Collectorate with the Railroad.

Surveying the proposed Extension of the Nagotna and Mahableshwur Road to Dhurumther.

This was surveyed and the line was marked out and the levels taken by myself last season, since which I have had no time to take the preparation of the plans in hand; they will, however, be taken in hand this next monsoon.

Surveying the new Line from Oorun to Dapoolee near Panwell.

Similar remarks apply to this road also. The object of the line is for the benefit principally of the salt traffic to the Deccan. This line crosses a creek at Belpara, which separates the island of Carranja from

the main land, and is made use of by Native craft in stormy weather. In preference to building a viaduct over this creek where the banks are low, sufficiently high to admit of the passage of boats without dismantling their rigging, the Chief Engineer has suggested that an iron swing bridge be erected; and I propose designing accordingly, as the site is particularly suited for a bridge of the above description.

Surveying and Marking out the new Line of Road from Poinar to Alibaug.

This line I marked out last season and completed the levelling in May last, and nine of the plans, of which there are ten, have been drawn. The estimate will be taken in hand as soon as the usual annual office work is completed. This road crosses the Sagurghur range of hills at a place called Karlee Khind; the ascent and descent are laid out at a gradient of 1 in 20, and the total length of this portion is about two miles. The total length of this road, up to the point where it meets with the existing entrance road into Alibaug, is a little more than nine miles. A road between Dhurumther and Poinar, a distance of nearly three miles, has been made and opened.

Surveying the Line from Nagotna to the boundary line of the Tanna Collectorate near Parr, and the Branch Roads to Wurrundur Ghaut and Roha.

The survey of the country is in progress. An estimate for bridging and draining some of the streams on the existing line has been called for by Government; but as the road requires considerable alteration in order that proper sites may be obtained, it is requisite that a survey of the country should be made in the first instance.

Making emergent Repairs to the Bridge near Panwell.

Completed on 1st December 1856. The planking and railing were renewed where requisite, as also sundry other pieces of timber that were found to be in a decayed state.

Rebuilding eight Drains on the Road from Panwell to Oolwa.

I reported to the Superintending Engineer that several drains were unsafe and falling down, consequent on their original construction being

faulty ; and as he was shortly coming down into my Collectorate on his tour, he proposed taking the opportunity of inspecting them in my company, and it was decided that eight drains must be rebuilt : accordingly an estimate was prepared, and sanctioned. Under the immediate superintendence of myself.

Providing the portion of the Tanna Road between Coorla and Vehar, as far as the site of the Lake, with a layer of Metal three inches thick.

This has been lately sanctioned, and instructions received that the metal was to be spread on the road and consolidated as fast as it could be got ready ; accordingly the work is in progress. From the great scarcity of work-people and the close vicinity of the Vehar Water Works, as also the great despatch with which it is required to be executed, the work will prove much more expensive than originally supposed by Lieutenant Henry ; a supplementary estimate of Rs. 5,789 has accordingly been submitted. Under the immediate superintendence of Mr. Robins, Sub-Assistant Executive Engineer.

Constructing a Protecting Slope to the Natural Bunder at Bassein.

This work was proposed by Colonel Scott, Superintending Engineer, as necessary in order to protect the natural Bunder from the encroachment of the sea, which is making rapid ravages thereon. That the encroachment of the sea has been very great in the course of only a few years, is evident from the appearance of the coast. There is a well situated about fifty yards beyond the very commencement of the natural landing-place, which, ten years ago, according to all accounts, was some distance inland ; it now has the appearance of an isolated tower eighteen feet high. Not far from the same spot, about six years ago there was a Customs Chowkey, of which not a stone now remains. The proposed rivetted slope contains 10,631 cubic feet of dry rubble, and its greatest perpendicular height is four feet six inches, the greatest breadth of slope being twenty-five feet. This work will be completed before the monsoon, and Mr. Robins reports that he is

of opinion that it will answer the desired end, although it may require a little looking to after the monsoon. Not having seen the work, I can offer no opinion upon it at present.

Under the immediate superintendence of Mr. Robins, Sub-Assistant Executive Engineer.

Providing Glazed Windows and Venetian Shutters to the Travellers' Bungalows at Tanna, Nagotna, Indapoor, Mahar, and Poladpoor.

Those in the Tanna bungalow have been erected; but they could not be erected in the other bungalows (which are situated on the road to Mahableshwur) until the monsoon, owing to the number of travellers on the road in the hot months.

REVENUE DEPARTMENT.

Statement No. 2 of Budget for 1856-57.—220. *Fourteen Chowkies at Salt Works in Salsette.*

These Chowkies are built entirely of timber, the posts being let into masonry. There are two classes, called 3rd and 4th class; the former consists of two rooms of 8 by 12 feet and 10 feet by 12 feet, both being 6 feet high; and the latter of one room 12 feet square and of similar height. They are to be erected at the following places in the Salt Works, viz:—

At Ghautkoper	Two,	3rd Class.
Trombay	One,	ditto.
Kaveney	One,	ditto.
Ghautkoper	Two,	4th Class.
Maloomba	One,	ditto.
Davenar	One,	ditto.
Trombay	Three,	ditto.
Doongur	Two,	ditto.

These Chowkies will be all completed before the rains. Under the immediate superintendence partly of Lieutenant Browne, Engineers, and partly of Mr. Robins, Sub-Assistant Executive Engineer Tanna Collectorate.

221. *Enlarging the Office of the Deputy Commissioner of Customs at Oorun.*

This work, though sanctioned in the Budget of 1856-57, was not commenced until 18th March 1857, consequent on a correspondence that ensued relative to a certain tender which exceeded the estimate by a large sum ; the result of the correspondence was that a sum in excess of the original amount sanctioned was granted, under the explanation that prices had risen considerably since the estimate was framed. The foundation and plinth are completed and the walls are in progress, and it is expected that the building will be roofed in before the heavy rains set in.

This building is situated in the compound of the Deputy Commissioner's residence, and affords the following accommodation :—

One centre room (17·5 × 17·5) for Carkoons ;
One room (18·5 × 15·75) for English Writers;
And another of the same size for Records.

Under the immediate superintendence of myself.

222. *Cutcherry for the Sir-Carkoon at Oorun.*

This Cutcherry is situated at Moria Bunder, close to the shore. Its foundation and plinth are completed and walls commenced ; it will be, it is expected, roofed in before the heavy rains set in. It affords the following accommodation :—

One general room (30 × 30) for Sir-Carkoon and Establishment.
Two rooms (30 × 15) for Export and Import Departments respectively.
Two rooms (15 × 12¾) for a Liquor and Customs' Dufter Room respectively.
One room (13½ × 12¾) for Salt Department Dufter Room.
An open verandah in front (60 × 15) for the accommodation of Sepoys and the public, with a water-room for Brahmins in one corner (7½ × 9½).

The circumstances attendant on the delay of the commencement of this work, which was sanctioned in the Budget of 1856-57, are similar to those quoted as regards the preceding work.

This work was commenced on 1st April 1857, under the immediate superintendence of myself.

226. *Cutcherry for the Sir-Carkoon at Trombay.*

This building consists of a main room, or office, 22 feet square and 10 feet high, with a verandah 43½ feet long by 6 feet wide. On one side there are two rooms set apart for the Outward and Inward Dufter, 11 feet long by 9 feet wide; and on the other there are two rooms for the use of the Register, Shroff, and Salt Department, 9¼ feet long and 9 feet wide. The work was commenced in April 1857; the foundation and plinth are finished and the walls are well up, doors and windows fixed, and all the material on the spot.

This work was sanctioned in the Budget of 1856-57. The cause of delay in commencing this work is precisely similar to that quoted regarding the two preceding works. Under the immediate superintendence of Mr. Robins, Sub-Assistant Executive Engineer Tanna Collectorate.

Extraordinary Repairs to the Roof of the Deputy Commissioner's Bungalow at Oorun.

The whole roof was infested with white ants; the rafters were principally attacked, but several of the main timbers had to be renewed simply because they were not of sufficient scantling and had consequently settled considerably. This work is just completed. Under my own immediate superintendence.

Constructing a Bungalow at Alibaug for the Sub-Collector of Colaba.

This bungalow was commenced on the 11th January 1857, and it is to be hoped will be roofed in before the heavy rains set in; at present the foundation and plinth are completed and the walls up about three feet. The bungalow consists of a drawing-room and dining-room, each 10 × 18 on the square, with a semi-hexagonal front, with an elliptical arch of twelve feet span between them; two bed-rooms, each 18 × 18 on the square, with a semi-hexagonal front, with dressing-rooms and bath-rooms attached to each, built within the verandah,

which entirely surrounds the building and is ten feet wide. Under the immediate superintendence of myself.

Making certain Repairs to the Collector's Bungalow at Tanna.

The roof was dismantled, and repairs to the trusses, &c. were executed; some of the main timbers were renewed, having been found in a decayed state; rafters and battens were also renewed where requisite; the eaves-board and planking was entirely renewed and painted; the choonam terraces and boarded ceilings over the front and back porches were entirely renewed and the columns replastered, as also the walls of the bungalow where requisite; the walls were white-washed and yellow-washed inside and outside, and the doors and windows painted; the weather-boards and fixtures were repaired or renewed as found necessary; the roof of the godown, cookroom, stable, &c. were put into proper order; two cesspools in the immediate vicinity of the bungalow were filled in and rebuilt further off.

Constructing a Dam at Wasee.

This work was completed some years ago, but a bill has lately been called for by the Auditor of Public Works Accounts for a sum of Rs. 1,252-8-3, which I refused to audit, of the accounts submitted by Surveyor Gungaram Balajee; hence the insertion of the work in this report.

Hauling up and letting down the Sluice Gates of the Wasee Dam.

Completed.

Restoring the Bed of the Wasee Creek to its original form, and affording protection to the Banks.

The object and nature of this work, as also the necessity for its execution, have been fully commented on in my report of last year; any repetition is therefore unnecessary. Suffice it to say that the work was finally completed on 18th February 1857, and has most fully answered the purpose for which it was intended. Great difficulty was experienced in carrying out this work, owing to the scarcity

of Beldars and the difficulty of getting the stone together, and besides the work could only progress by tides.

Under the immediate superintendence of myself.

Making Emergent Repairs to the Mamlutdar's Cutcherry at Poinar.

These repairs were of an ordinary nature ; they were completed on 1st October 1856.

JUDICIAL DEPARTMENT.

Statement No. 2 of Budget of 1856-57. — 364. *Moonsiff's Court-house at Moorbar.*

This work was commenced in October last, at a time when there was no Assistant in charge. The walls are up nine feet, and foundation and plinth completed; door and window frames, and windows with iron bars, fixed ; roof timber all prepared, as also doors and windows. The sanctioned amount will not suffice, so a supplementary estimate for Rs. 933 has been submitted. Great difficulty is experienced in obtaining materials at such an out-of-the-way place.

Under the immediate superintendence of Lieutenant Dickens, 64th Queen's Regiment, and of Lieutenant Browne, Engineers, who is at present in charge.

Putting up Jungle-wood Ceilings in the Prisoners' Rooms in the Compound of the Magistrate's residence at Tanna.

Ceilings of a simple description were erected.

Removing the Court-house at Dhanoo and rebuilding it more inland.

This Court-house was only built about four years ago, and it was then sixty feet clear of the highest tides. On the 15th April 1856, Mr. Jones, the Collector of Tanna, inspected the building and reported it to be in a dangerous condition, and recommended some measures being taken immediately to protect it. But unfortunately there was no one available for the duty ; the measurements were, however, taken in the monsoon, and a plan and estimate submitted for affording the requisite protection, and at the same time an estimate for rebuilding

the Court-house further inland: and although the latter was double the expense in the first instance, I recommended it as a certain remedy, whereas the former was liable to failure on account of the silting nature of sand when exposed to the action of water. The old building is being dismantled, and Mr. Robins has chosen a new site, facing a large creek, where the ground is hard and firm. On the bank of the creek there is an old sea wall, which was built when the fort was erected, some 150 years ago, and is still in a state of excellent preservation.

Under the immediate superintendence of Mr. Robins, Sub-Assistant Executive Engineer Tanna Collectorate.

MILITARY DEPARTMENT.

Statement No. 2 of Budget for 1856-57. — 411. *Privies for a Wing of the Native Infantry at Tanna.*

The materials for this work have all been collected, and the work was just commenced, when great objections were raised to the site by the Assistant Commissioner of Customs, on the ground that the dirt and filth from the necessaries would not be carried away by the tide, as was supposed, but would be deposited below his bungalow, on account of natural obstructions in the bed of the river. This circumstance had been overlooked by Mr. Scott, who, I believe, chose the site. The Assistant Commissioner proposed that the necessaries should be erected along the main channel and on the further side of a small island. An estimate of the expense is accordingly being prepared; this plan will, however, prove very expensive, as a long trestle approach must be erected across the side-channel, of sufficient height to admit of the passage of the Native craft without interruption.

Under the immediate superintendence of Lieutenant Browne, Engineers, and Mr. Robins, Sub-Assistant Executive Engineer, who at present has charge.

449. *Crane on the Pier at Oolwa.*

Completed on 28th February 1857. This crane is similar in every respect to those on the Apollo Pier, Bombay. The crane was anchored back, for better security, by three iron bars, one inch square and

thirty feet long, pinned to the rear of stout posts by cross pieces of bar iron passing through eyes made at the end of the main pieces. Under the immediate superintendence of myself.

Constructing an Earthen Pipe Drain to carry off the Refuse Water from the Cisterns of the two Wells in the Military Lines at Tanna.

This work was completed in July 1856. The pipe was formed of earthen ware, portions fitted into each other, having the joints well filled with an oil cement to render the whole water-tight, and laid at the bottom of a trench, excavated for the purpose, without any foundation. Under the immediate superintendence of Lieutenant Dickens, 64th Queen's Regiment.

Constructing Quarters for the 2nd Class Servants attached to the Military Hospital at Tanna.

This building was erected according to a design approved of by the Civil Surgeon at Tanna, for the accommodation of Bhistees and sweepers, under the immediate superintendence of Mr. Robins, Sub-Assistant Executive Engineer.

Ordinary Repairs; General, Ecclesiastical, and Military Departments.

Ordinary repairs to the roads and buildings in these Departments were executed.

M.	F.	Y.	
94	1	48	No. of miles of metalled roads kept in repair.
199	0	210	No. of miles of moorum roads repaired.

Petty ordinary repairs were also executed to the buildings in the several Departments.

2. Having given a concise description of each work in progress during the past year, I propose classing the remainder of my report under the following heads:—

1st. Important works remaining to be done in the Collectorate, not yet sanctioned or estimated for, as far as is at present known.

2nd. In what way my Assistants, subordinates, and myself have been employed.

Important Works remaining to be done in the Collectorate, not yet Sanctioned or Estimated for, as far as is at present known.

New line of road from Khapoolee to Dhurumther *viâ* Penn, twenty-three miles long;—The plans and estimate for this work were submitted in October last, but Government objected to include the work in the Budget of 1857-58 on account of the expense. The advisability of undertaking the first six miles from Dhurumther in the first instance, will form the subject of a separate report.

The prolongation of the existing road lately made between Dhurumther and Poinar to Alibaug on the Coast;—This line has been marked out and the levels taken, and nine of the plans (ten in number) drawn. The estimate will be submitted in time for insertion in the Budget of 1858-59.

The new line of road from the Penn Road near Dhurumther to Nagotna;—This line has been marked out and the levels taken, and the preparation of the project will be taken in hand as soon as the preceding one is completed.

Bridging and draining the road under construction from Mahar to the foot of the Wurrundur Ghaut;—The levels for this project have been taken. Endeavours will be made to submit the plans and estimate in time for the Budget of 1858-59.

Bridging, draining, altering and widening the existing road from Nagotna to the detour of the new line under construction to the Wurrundur Ghaut;—The requisite survey is being made. The intimate connection of the five preceding works with each other, has been explained in my report of last year.

New line of road between Wassind and the Colsette Ferry and the branch to Kusselee Bunder;—This is being surveyed and the levels taken, and the plans and estimates, it is to be hoped, will be submitted in time for the Budget of 1858-59.

New line of road from Oorun in Carranja *viâ* Belpara to Panwell, considered in connection with the proposed masonry bunder at Mora, was described in my last report. The preparation of the project has not yet been taken in hand.

Bunders at Mandwa and Dasgaum.

Continuation of the road from Capoor Veer to Chiney Khind to Ghorebunder;—The levels are being taken.

Road between Callian and Bhewndy;—As per last report.

Proposed road between Bassein and Bhewndy;—Nothing has been done regarding this.

New road from the Narell Station to the foot of the Koosoor Ghaut.

New road from the Narell Station to the foot of the Bheema Shunkur Ghaut.

Masonry Bunder at Mora Bunder in the Island of Carranja.

Masonry Bunder at Alibaug.

Road from the Mahableshwur Road to Nizampoor.

Road from the Mahableshwur Road to Goregaum.

Road from Pursik Point *viâ* Tulloja to Panwell.

Road from Alibaug *viâ* Mandwa to Rewus Bunder.

In what way my Assistants, Subordinates, and myself have been employed during the past year.

Lieutenant Dickens, 64th Queen's Regiment.

This Officer joined me in February 1856, and almost immediately went to Mahableshwur on sick certificate, and remained there until the monsoon. During that season he conducted the usual office work, and at the commencement of the season had charge of two Divisions, which is too much for one Officer; he was, however, relieved of the Tanna Division by Lieutenant Henry. The principal work he had to attend to, during the monsoon, was the repairs to the metalled roads in and about Salsette and the Agra Road. Lieutenant Dickens, left me to join his Regiment (proceeding to Persia on field service) just at the commencement of the working season.

The following plans and estimates were submitted by Lieutenant Dickens:—

1. Revised Estimate for erecting quarters for the 2nd class servants attached to the Military Hospital at Tanna.

2. Abstract Estimate for repairing the horse-boat plying at the Ghorebunder Ferry.

3. Abstract Estimate for repairing the horse-boat plying at the Datewra Ferry.

4. Abstract Estimate for repairing the Collector's Bunder-boat at Tanna.

5. Revised Estimate for constructing a room for the accommodation of the Police Office Establishment at Tanna.

Lieutenant Henry, 86th Queen's Regiment.

This Officer joined me in the middle of the rains; he took charge of the Tanna Division from Lieutenant Dickens, and the principal work entrusted to him was the metalling of the roads in and about Salsette, which Lieutenant Dickens had commenced. He also superintended the clearing out and draining of the Masoonda Tank.

The following plans and estimates were submitted by Lieutenant Henry:—

1. Estimate for enclosing the compound of the new Post Office at Tanna by a ditch and with an earthen embankment.

2. Revised Estimate for constructing a room for the accommodation of the Police Establishment at Tanna.

Lieutenant Browne, Engineers.

This Officer joined me on the 21st November 1856, and for a few months had charge of the works in progress in the Tanna and Agra Road Divisions; but I relieved him of the former as soon as Mr. Robins, Sub-Assistant Executive Engineer, became available. Besides the superintendence of the works in progress, Lieutenant Browne has submitted the following plans and estimates:—

1. Suplementary Estimate for constructing a dam at Mokhana.

2. Supplementary Estimate for constructing the Moonsiff's Court-house at Moorbar.

3. Estimate for making emergent repairs to the roof of the Travellers' Bungalow at Kussara (cancelled).

4. Estimate and Revised Estimate for making thorough repairs to the Bunder at Kalhair.

5. Estimate for ordinary repairs for 1857-58 to the roads in the Agra Road Division.

6. Estimate for ordinary repairs for 1857-58 to the roads in Bhewndy Cantonment.

7. Estimate for ordinary repairs to the Travellers' Bungalows, Dhurumsallas, and Store-room in the Agra Road Division.

8. Supplementary Estimate for ordinary repairs to the Bombay and Agra Road between Khurdee and Kussara.

9. Estimate for building a Cutcherry for the Mamlutdar at Mahim.

10. Estimate for ordinary repairs to the lines of roads in the Assistant Executive Engineer's range at Tanna.

11. Estimate for the ordinary repairs to Travellers' Bungalows and out-houses.

The following plans have also been sent in :—

Plan for the construction of the Mokhana Dam according to the present design.

Rough Sketch of Kalhair Bunder.

Rough Plan of the longitudinal sections of the bed of the Shapoor River with three cross sections.

Plan of the old and new line between Khurdee and Wassind, together with the Tracing of the line of Railroad.

Besides the work above enumerated, Lieutenant Browne has taken the levels of the beds of the following rivers or nullahs, extending half a mile above and below the site of the Bundara or bridge, as the case may be, with cross sections at, below, and above the sites :—

Mokhana Valley;
Shapoor Bridge; and
Arra Bridge.

He has also laid out, with a spirit-level, eight miles of the new line between Wassind and Shapoor, and surveyed the line between Khurdee and Beervadee, a distance of six miles.

Lieutenant Browne has been also engaged in laying out a new line between Wassind and the Colsette Ferry, and has completed the first six miles, as far as Pudgha.

Lieutenant Browne has travelled, inspecting works, since the time he joined, a distance of 709 miles.

Mr. Robins, Sub-Assistant Executive Engineer.

Mr. Robins joined me in November 1856. This gentleman was specially appointed to prosecute the survey of the line of road between Pursik Point and Panwell, a distance of about eighteen miles; he marked out the line and took all the levels, including those of the beds of rivers intersecting the line. Mr. Wainwright prosecuted the survey and drew the survey plan. The latter was sent in complete for the whole distance, together with the estimate of half the line, viz. from Pursik to Tulloja. On the completion of this work Mr. Robins took charge of the Tanna Division, with Colonel Scott's permission, in February 1857, and since then, besides superintending the works in progress, has executed the following work :—

Marked out new Cutcherry at Trombay.

Proceeded to Dhanoo and selected a new site for the Court-house at that place.

Obtained data over about 100 miles of road for framing a Road Statement called for by the Chief Engineer of Public Works.

Reported on the road between Andharee and Wagoorla leading to Versowah.

Reported on the old Churches at Bassein.

Reported on the clearing of a tank at Gokhirwa in the Bassein Talooka.

And submitted the following plans and estimates :—

1. Estimate for putting the road between Andharee and Wagoorla into good order.

2. Plan and Estimate for the road from Pursik Point to Tulloja.

3. Rough Sketches and Estimate for putting up wire rope for the transit of mail bags across the Tansa River.

4. Plan and Estimate for building rubble slope to the Bunder at Bassein.

5. Estimate for repairing a bridge at the Gokhirwa Village in the Bassein Talooka.

6. Plan and Estimate for constructing a branch road leading to the Sir-Carkoon's Cutcherry at Bassein.

7. Estimate for making ordinary repairs to the ramp at Colsette Ferry.

8. Estimate for making ordinary repairs to the Cantonment roads at Tanna.

9. Supplementary Estimate for metalling the road from Coorla to the Lake at Vehar.

10. Estimate for metalling the road from the bund to the village at Vehar.

11. Estimate for metalling the road from the Railway Station to the village of Coorla.

12. Estimate for building a drain near the Railway Station at Coorla.

Mr. Robins reports that he has travelled, since the time he joined, 989½ miles, and that he has paid and superintended the payment of work-people on all his works.

Serjeant Cheetham, Overseer.

Serjeant Cheetham has been employed on the following works during the year:—

Barrogaum Bridge and four small bridges on the mail road between Panwell and Khapoolee.

Annual repairs to the mail road between Oolwa and the boundary of the Tanna Collectorate on the Bhore Ghaut, thirty-three miles.

Erecting crane at Oolwa.

Rebuilding two small drains on the Oolwa Road.

Building Sub-Collector's bungalow at Alibaug.

Repairing the roof of the Deputy Commissioner's bungalow at Oorun.

Enlarging and putting on a new roof to the Deputy Commissioner's office at Oorun.

Building Sir-Carkoon's Cutcherry at Oorun.

Serjeant Cheetham has performed all the work entrusted to him to my entire satisfaction, and has travelled 3,020 miles.

Mr. Wainwright, Sub-Assistant Surveyor and Builder.

Mr. Wainwright was employed under Mr. Robins for about three months in surveying the country between Panwell and Pursik Point, of which he drew the rough and fair plans. Mr. Robins gives a good report of him. On the completion of the survey, he left, to rejoin the Executive Engineer's Office at Ahmednuggur.

Annundrow Bappoojee, Surveyor and Builder.

This Surveyor was employed, from the commencement of the official year until the monsoon, in completing the survey of the country between Dhurumther and Alibaug; after which he was employed in drawing the fair plan of the survey, over which he was engaged a most unpardonable time: and when the drawing was finished, it was engrained with dirt to such an extent, that I could not get it sufficiently clean to enable me to pass it, and eventually I was obliged to draw it myself. This Surveyor was transferred to the Agra Road Division immediately on the opening of the working season, and was placed in special charge of the Moorbar Cutcherry, where he remained until February, when Lieutenant Browne employed him on the survey of the new line between Wassind and the Colsette Ferry, as far as the Kerpa Khind, a distance of about eleven miles. He also made a survey of the existing road between Kussara and Shapoor, a distance of twenty-four miles, and of the new line between Beervadee and Shapoor, a distance of eight miles.

Lieutenant Browne reports that this Surveyor's capabilities are good, but that he is very much inclined to be indolent and wants looking after, and that his surveys are not always to be depended on; he copies plans fairly and can make a tolerable plan, but cannot sketch ground correctly.

Assistant Surveyor Govind Moreshwur.

This Surveyor was employed in completing the survey of the country between Nagotna and Dhurumther before last monsoon, and he plotted his work to a scale of 300 feet to an inch, and afterwards, in the monsoon, replotted it to a smaller scale of 800 feet to an inch. After the monsoon, as I had then no Assistant, he was placed in charge of the road between Khurdee and Kussara to superintend the finishing off of the

parapet walls of the bridges on the 2nd and 3rd Divisions. In January, Lieutenant Browne despatched him to survey the country between Kurpa Khind and the Colsette Ferry, a distance of eleven miles, which he has completed. He also surveyed the branch road to Kusselee Bunder, and the ground between Bhewndy and Callian and from Wassind to Shapoor, making a total of twenty-four miles. All these surveys have been plotted. Besides the work enumerated above, he has prepared the following estimates :—

Emergent repairs to the Kalhair Bunder.

Ordinary repairs to the Travellers' Bungalows, out-houses, and store-rooms in the range of the Agra Road Division.

Lieutenant Browne reports that this Surveyor's abilities are not first-rate, but that he has found him industrious; he surveys more correctly than Annundrow Bappoojee, but has no idea of sketching ground, and is no draftsman; but he is useful in superintending works.

Raghoba Hurjee, Assistant Surveyor.

Raghoba Hurjee is attached to the Tanna Division, and is under the orders of Mr. Robins at present. Mr. Robins expresses his concurrence in the report made by Lieutenant Cotgrave last year respecting this Surveyor, which was that "although he had satisfactorily performed the work entrusted to him, still he regrets to be obliged to report that he is wanting in zeal and activity, and evinces but little readiness in moving about in the Districts, having a decided preference for work in the vicinity of head-quarters." Mr. Robins also further reports, since he took charge of the Tanna Office, that this Surveyor's time has been entirely engrossed in preparing the supplementary estimate of the Chiney Khind road, and that therefore he has been of very little assistance to him; this estimate, now that it is prepared, Mr. Robins says is the most incomplete document he ever saw. With reference to the above, I shall shortly make this Surveyor's conduct the subject of a special report. The undermentioned work has also been performed by this Surveyor during the year:—

1. An Estimate for repairs to the horse-boat plying at the Danda Ferry in the Mahim Talooka.

2. Took the measurements and prepared a Plan and Estimate for building a protection slope to the Moonsiff's Court-house at Dhanoo, also an Estimate for removing the building further inland.

3. Report on the state of the Travellers' Bungalows (six in number) between Bassein and Oomergaum.

4. Report on a private building at Mahim, which it was proposed to purchase for a Cutcherry.

5. Plan and Estimate for building quarters for the Deputy Postmaster at Tanna.

6. Superintended the construction of the waste-channel of the Masoonda Tank at Tanna.

7. Took measurements and prepared an Estimate for repairs to the Collector's bunder-boat at Tanna.

8. Plan and Estimate for the Office of the Superintendent of Police at Tanna.

9. A rough Plan of the line of road between Sion and Colsette.

10. Estimate for petty ordinary repairs to the Churches at Tanna and Bandora.

11. Inspected and reported on the bridges and drains on the road from Coorla to Vehar.

12. Marking out ditch and bank round the compound of the Post Office at Tanna.

13. Estimate for petty repairs to the Travellers' Bungalow at Tanna.

14. Estimate for repairing the roof of the cookroom, privies, and railing of the Civil and Ghaut Local Hospital at Tanna.

15. Estimate for repairing the bungalow used as the Assistant Executive Engineer's Office at Tanna.

16. Surveying rivers and nullahs on the dawk line between Callian and Tarapoor.

17. Taking the measurements and preparing the supplementary Estimate of the road from Capoor Veer to Chiney Khind.

18. Measurements on the road between Andharee and Versowah, $\frac{3}{4}$ mile.

19. Surveying a line of road between the boundary of Vovala and Ghorebunder.

Besides these works the Surveyor made several minor inspections, and performed a little office work.

Raghoba Shunkurjee, Boat-Builder Maistree.

This Maistree was placed at my disposal in order to superintend some new rafts which had to be built for the ferries in the Collectorate; he is employed under Mr. Robins, who reports most favorably of his diligence and zeal in carrying out the work that has been entrusted to him. I intend shortly recommending that this man's pay should be increased; he only receives now Rs. 40 per mensem.

The following is a list of the work executed by him:—

1. Building three rafts for the ferries in the vicinity of Tanna.
2. Building one raft for the use of the Colsette Ferry; the two boats are completed and the decking is in progress.
3. Building fourteen Chowkies for the Salt Works in the Trombay Division of the Salsette Talooka.
4. Extensive petty ordinary repairs to the Collector's Bungalow and out-houses at Tanna.
5. Putting up junglewood ceilings in the Prisoners' Rooms in the compound of the Collector's residence at Tanna.
6. Superintended petty ordinary repairs to Travellers' Bungalow at Tanna.
7. Superintended petty ordinary repairs to sixteen Military Pendalls at Tanna.
8. Petty ordinary repairs to Civil and Ghaut Local Hospital at Tanna.
9. Petty ordinary repairs to the Military Hospital at Tanna.
10. Superintended erection of the quarters for the Establishment attached to the Military Hospital at Tanna.
11. Repaired furniture in the Assistant Collector's Bungalow at Ghorebunder.
12. Repairing lamp post at Trombay Pier.
13. Superintended the removal of obstructions in the Tanna River.
14. Constructing two foot passages over the waste channel of the Masoonda Tank at Tanna.

15. Constructing a ditch and embankment round the compound of the Post Office at Tanna.

16. Varnishing shelves and pegs in the Travellers' Bungalow in the Tanna Division.

17. Plan and Estimate of a horse-boat proposed to be used at the Ghorebunder Ferry.

18. Estimate for ordinary repairs to the Military Pendalls at Tanna for 1857-58.

19. Estimate for ordinary repairs to Church at Tanna.

20. Estimate for ordinary repairs to Travellers' Bungalows and store-rooms, &c.

Mr. Walker.

Mr. Walker was appointed by me to superintend the new line of road from Khurdee to Wassind, with the permission of the Chief Engineer of Public Works. Mr. Walker was formerly a Serjeant in the Sappers, and employed in the Public Works Department, but he was remanded to the Artillery for habitual drunkenness. While attached to the latter Regiment he bore a good and steady character, and, on his applying to me for employment, I forwarded the same to the Superintending Engineer and obtained the requisite sanction. Mr. Walker is at present in a delicate state of health, and is suffering from general debility, brought on, I believe, really from his not having had the means, since he took his pension, of obtaining the necessaries of life; his pension is very small. Lieutenant Browne says that since he joined, in March, his health is considerably improved, and that he hopes that during the monsoon he will regain his strength entirely, so as to be able to undergo the exposure and fatigue necessary to enable him to superintend the work entrusted to him efficiently. He has been so short a time under Lieutenant Browne, that he is unable to report on his qualifications at present, but has much pleasure in bringing to my notice that as yet he has perceived no signs whatever of a return of the vice on account of which he has suffered so severely.

Shivram Shayenna, Sub-Assistant Surveyor.

This Surveyor joined me fresh from the Poona School, on 15th December 1856, and he has been employed in my office on the following works:—

Tracing the plans of the undermentioned buildings:—

1. Plan for Court-houses in the Tanna Collectorate.
2. Plans for 4th Class Chowkies at the Penn Salt Works.
3. Plan for the Sub-Collector's Bungalow at Alibaug.
4. Plans for out-houses attached to the Post Office at Callian.
5. Plan for enlarging the Deputy Commissioner of Customs' Office at Oorun.
6. Plan for Sir-Carkoon's Cutcherry at Oorun.
7. Plan for huts for Native Troops at Tanna.
8. Plan of the survey of road between Dhurumther and Nagotna.
9. Plan of road from Khapoolee to Dhurumther *viâ* Penn.
10. Plan of road from Poinar to Alibaug.
11. Plan of road between Oorun and Dapoolee *viâ* Belpara.
12. Two tracings of the Map of the Tanna Collectorate.
13. A trace of a Ventilator of Barracks for the Horse Artillery at Poona.

Drawing the undermentioned plans:—

1. Plan for Superintendent's and Electric Telegraph Office at Matheran.
2. Plan for 4th Class Chowkies at the Penn Salt Works.
3. Plan for Custom-house at Carranja Bunder.
4. Plan for Post Office at Callian.

Prepared calculations and estimates of the undermentioned works, including the writing of the fair copies of the latter:—

1. Estimate for Superintendent's and Electric Telegraph Office at Matheran.
2. Estimate for 4th Class Chowkies at the Penn Salt Works.
3. Estimate for Custom-house at Carranja Bunder.
4. Estimate for Post Office at Callian.
5. Estimate for out-houses of the Post Office at Callian.
6. Estimate for huts for Native Troops at Tanna.
7. Estimate for Commissariate shed at Khapoolee.
8. Estimate for drain at Borway.
9. Examined and corrected an Estimate for eight drains on the Oolwa Road.

This Surveyor draws very neatly, and I have found him useful in that respect, as also in preparing estimates and examining calculations I gave him; I am not acquainted with his qualifications in field-work, never having employed him out of my office.

Bhavoo Sudasive, Sub-Assistant Surveyor.

This Surveyor also joined me first from the School on the same date. He has done the following work:—

Plans and Estimates.

1. Examining and copying Estimates of the Post Office and out-houses at Matheran.
2. Tracing and printing Plan of the 4th Class Chowkies.

Survey and Out-door duties.

1. Surveying and Plotting the road from Nagotna to Mahar, forty miles.
2. Inspecting and framing Estimates of the repairs to the Mahalkurries' Cutcherries at Roha and Tulleh.
3. Inspecting and framing Estimates of the repairs to the Superintendent of Police's lines at Roha and Tulleh.
4. Inspecting and framing Estimates of the repairs to the Salt and Customs Chowkies at Roha Bunder, Boree, Rohote, Gunga, Nahavee, Kockbun, Save, Oosur, &c.

I have seen part of the survey this Surveyor has plotted, and, as far as I could then judge, it appeared pretty correct; but I cannot tell exactly of course until I have gone over the ground. He appears to have done a fair amount of work.

Hurree Bullal, Sub-Assistant Surveyor.

This Surveyor also joined me at the same time, and has executed the following works:—

Traced Plan of the Moonsiff's Court-houses in Tanna Collectorate.

Traced Plan of the Khurdee Cistern.

Traced Plan of the Rurtoonda Valley.

Surveyed and plotted the undermentioned portions of ground:—

1. Portion of ground between Naringee and Chinchoolee.
2. Extension of Wasee Road to the confluence of the Penn and Nagotna Rivers.

3. Portions of ground near Bhokushul.
4. Inspected repairs to the Mamlutdar's Cutcherry at Nusrapoor.

This Surveyor appears to be able to conduct a survey with the prismatic compass and chain, but has not the remotest idea of sketching the ground.

By myself. Besides superintending the different works in my own Division, and making periodical inspections of those works which were entrusted to my Assistants, to perform which duty I have travelled 1,948 miles (viz. 660 miles per rail, 1,116 miles on horseback, and 172 miles by boat), I have performed the following special work, independent of current office business:—

1. Marking out and taking the levels of the new line from Poinar to Alibaug on the Coast *viâ* the Karlee Khind, 10 miles. (This was commenced in April 1856). Number of days unknown.*
2. Writing descriptive Annual Report of progress for 1856-57 (6 days).
3. Prepared and calculated Supplementary Estimate for Barrogaum Bridge on the mail road from Panwell to Khapoolee (2 days).
4. Prepared and calculated Supplementary Estimate of the four small bridges on the same line (3 days).
5. Prepared Estimate for Venetians to Travellers' Bungalows and Peons' huts (1 day).
6. Drawing two Plans of the Penn Road, viz. the large survey plan and the design for one of the large bridges (18 days).
7. Prepared and calculated Estimate for the road from Khapoolee to Dhurumther *viâ* Penn, twenty-four miles, including bridging and draining (33 days).
8. Studying Murathee before the Examination, all day (6 days).
9. Proceeded to Tanna for Examination in Murathee (1 day).
10. Drawing Plan and calculating Estimate for Roha Bunder (4 days).

* No diary kept at that time, so the number of days cannot be given.

11. Numbering and finishing off the twelve Plans of the Penn Road (1 day).

12. Drawing nine Designs (of which there are ten) of the road from Poinar to Alibaug (84 days).

13. Taking levels for framing Supplementary Estimate and for Estimate for building and draining the road from Mahar to the foot of the Wurrundur Ghaut, a distance of about nine miles, including the levels of the beds of two large rivers with three cross sections (No. of days 4).

14. Marking out Roha Bunder (2 days).

15. Calculating and preparing Supplementary Estimate of Wurrundur Ghaut Road (2 days).

16. Taking levels of the existing road into Alibaug, a distance of about one mile (1 day).

17. Marking out and taking the levels for an aqueduct at Narungee.

18. Printing Plans of the Alibaug Cutcherry and Poinar Chowkey.

During the past year, since the 1st June 1856,* I have devoted eighty-seven days specially to travelling, for the purpose of inspecting the works in the Collectorate; this does not include the days put down against special work. It must also be understood that current office business was transacted on the days on which special work was performed.

3. I have now, I think, completed my report under the several heads, agreeably to the Government Resolution referred to in the first paragraph of this report; and all that remains for me to say is, that I find great difficulty in procuring a proper staff of efficient Maistrees for the conduct of works. I therefore trust the time is not far distant when that class of useful men will be placed on a permanent footing.

In conclusion, I beg to add, agreeably to instructions conveyed in the Superintending Engineer's Memo. No. 2236, dated 8th April

* No diary for May to refer to; none was kept.

1857, that no attempts have as yet been made in this Collectorate to destroy white ants, no one having been available for the duty.

I have the honour to be,

Sir,

Your most obedient Servant,

J. A. FULLER, Lieutenant,
Executive Engineer, Tanna Collectorate.

No. 5105 OF 1857.

PUBLIC WORKS DEPARTMENT.

Superintending Engineer's Office, Central Province, Poona, 2nd September 1857.

Transmitted to the Chief Engineer of Public Works, with reference to Lieutenant Southey's Memo. No. 4534, of 24th August 1857, together with a Sketch Map of the Tanna Collectorate.

W. B. GOODFELLOW, Colonel,
Superintending Engineer, Northern Province.

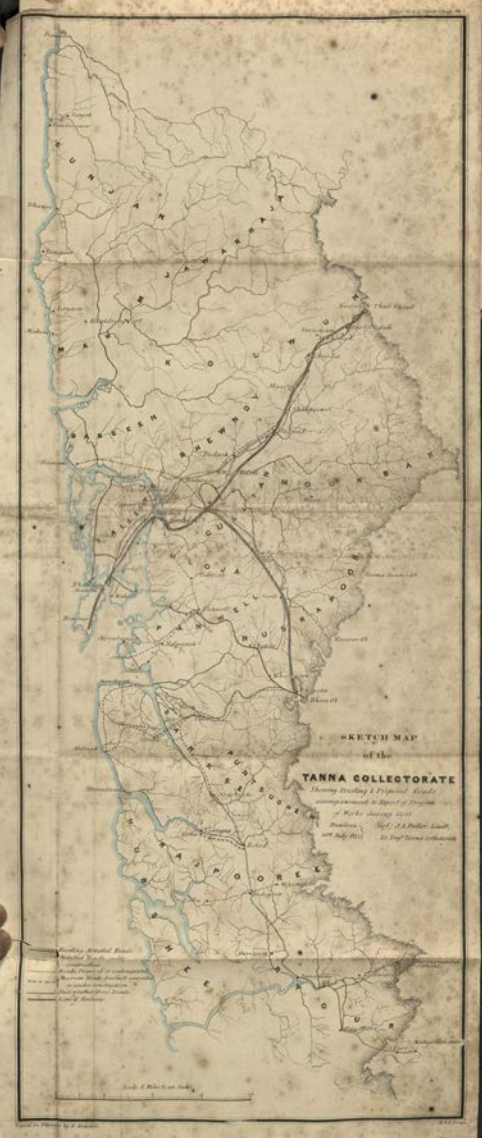
No. 5297 OF 1857.

PUBLIC WORKS DEPARTMENT.

Office of Chief Engineer of Public Works, Bombay, 8th October 1857.

To the Right Honorable LORD ELPHINSTONE, G.C.H.,
Governor and President in Council.

MY LORD,—In compliance with the instructions in the 5th paragraph of the Government Resolution under Mr. Secretary Hart's Memo. No. 1806, of the 27th November 1855, I have the honour to


SKETCH MAP
of the
TANNA COLLECTORATE
TANNA

submit Lieutenant Fuller's report of the operations of the Public Works Department in the Tanna Collectorate during the past official year, together with a Sketch Map of the Collectorate. The report is endorsed by Colonel Goodfellow, Superintending Engineer, but is, as might be expected, unaccompanied by any remarks from him, the Tanna Collectorate having but lately been added to the Districts under his superintendence. The report was not forwarded to me till the 2nd September, though it bears date 31st July 1857.

2. Lieutenant Fuller has furnished a very full and elaborate record of his proceedings during the past year, going into detail more than I think was necessary, and in more than one instance repeating the same information under separate headings and in varied forms. I shall endeavour to present a brief epitome of his report, not following the same order of subjects, but concentrating under one head the information as to each work or locality.

3. The following works are portions of the Bombay and Agra Road within the Tanna Collectorate :—

New line of road from Wassind to Khurdee, on which an expenditure of 30,000 Rupees has been specially permitted by the Government of India. Nearly twelve miles of this road are reported cleared, and the excavation for the Shapoor Bridge in progress. Lieutenant Fuller expresses a hope that this line may be open for the transit of the mails by the monsoon of 1858; but this will assuredly not be the case unless large additional powers of expenditure be granted, the estimates for this piece of road amounting to Rs. 1,84,450.

Items 28 and 29, Statement 1 of Budget for 1857-58.

Letter from Colonel Baker, Secretary to the Government of India, No. 3267, of 3rd July 1857.

The deviation which was planned and sanctioned in December 1853, to avoid a steep ascent on leaving Shapoor for Khurdee, is reported by Lieutenant Fuller to have been completed on 30th June 1856. Length 985 yards.

Item 104, Statement 2 of Budget for 1855-56.

On the road between Khurdee and Kussara, it appears from this report, that on 30th April there still remained to be completed the

caps to the piers of the Oomermalee Bridge and the slopes to the approaches of the Mokhana Viaduct. All the remaining bridges and drains on this expensive Division of the Agra Road, which has cost Rs. 29,000 per mile, are completed.

Of several works undertaken to increase the supply of water on this road, the following is Lieutenant Fuller's report:—

Item 121, Statement 2 of Budget for 1856-57.

A well at Atgaum, between Shapoor and Khurdee, has been deepened four feet, and now yields a constant supply of water. As the new line of road will leave this well at a distance, Lieutenant Fuller does not propose to deepen this well any further.

Item 82, Statement 2 of Budget for 1856-57.

The well at Wuruscoal, between Khurdee and Kussara, is completed, except portions of parapet and pavement. 22 feet deep; supply abundant. A supplementary estimate of Rs. 325 was found necessary, the original estimate being Rs. 1,039.

Item 83, Statement 2 of Budget for 1856-57.

Two wells in the Rurtoonda Valley, fifteen and eight feet deep respectively, will not be finished till next hot weather.

Item 123, Statement 2 of Budget for 1856-57.

A well at Kussara was being deepened four feet, and the deepening was expected to be finished before these rains.

Item 106, Statement 2 of Budget for 1855-56.

A dam across the Mokhana Valley was sanctioned with other works which had been designed by Lieutenant Scott in January 1855, and commenced under a contract in 1856; but in April 1856, Colonel Scott inspecting the work, discovered a spring in the principal excavation, and stopped the laying of the foundations. A fresh site, lower down the valley, was then selected, and the work was recommenced on the 1st January 1857, under the superintendence of Lieutenant Browne, Engineers, and is reported as nearly completed on 30th April. Unfortunately a considerable sum was expended on the first site before the work was abandoned, and Lieutenant Fuller has submitted a supplementary estimate of Rs. 3,049. Original estimate Rs. 4,936.

A cistern below the Khurdee Tank. This cistern was designed by Lieutenant Scott to collect the water percolating from the tank above, but, after it had made some progress, was stopped in April 1856 by Colonet Scott. The work was resumed under Lieutenant Browne's superintendence in February last, with considerable variations from the original design, executed in the manner directed by Colonel Scott. The cistern was completed on 30th April, with exception of the parapet walls and waste-water channel, and these were expected to be finished before the monsoon.

Item 106, Statement 2 of Budget for 1855-56.

The heightening of the Rurtoonda Dam, as designed by Lieutenant Scott, was finished in May 1856. The Bundara however has been found to leak, and Lieutenant Fuller considering very extensive alterations and improvements necessary to render this work effective, when he examined the dam last February, gave instructions accordingly to Lieutenant Browne, and states that a supplementary estimate will be sent in so soon as the progress of Lieutenant Browne's operations shall enable him to determine the quantity of mansonry required. Lieutenant Fuller states that a deposit of sediment, seven feet in depth, has already taken place above the dam, which he proposes to remove, and to keep the bed of the stream also clear in future, by "tunnelling a sluice through the wall." In consequence of the deposit "the water is now so filthy that even animals cannot drink it," according to Lieutenant Fuller's report.

Item 106, Statement 2 of Budget for 1855-56.

A new raft for the Colsette Ferry was nearly ready, and the two old rafts had been restored.

Venetian casements had been made to the Travellers' Bungalow at Khurdee, and the roof renewed.

A survey and levellings of the line from Colsette Bunder to Wassind have been taken, with the view of submitting a project and estimate for a new road between these places in time for the next Review. In the mean time the expense of keeping the old road, which is of most defective construction and in the worst condition, passable for carts, is very heavy, and requires large gangs of labourers constantly at work.

4. Road from Mahar to the foot of the Wurrundur Ghaut.

Item 4, Statement 2 of Budget for 1856-57.

For this road, 8 miles 6 furlongs 113 yards long, an expenditure of Rs. 7,051 was sanctioned, which provided for a raised embankment only, without drains. It was commenced in December 1855, and the earth-work was completed on 30th April last, "with the exception of some very heavy side-cutting along the banks of the Kal River near Beerwaree, for a distance of about three-quarter mile." Lieutenant Fuller has reported the sanctioned sum insufficient, and will submit a supplementary estimate. He states that an estimate for bridging, draining, and kerbing the road will also probably be ready for review and insertion in next Budget. As this line is a part only of an important communication with the interior over the Wurrundur Ghaut, and a toll has been directed to be levied on that Ghaut, it will probably be expedient to sanction the completion of this portion, which runs through the Conkan, as a first class road, and perhaps of the whole line eventually, when funds may become available.

5. A deviation from the old line between Mahableshwur and Nagotna, to make an old narrow bridge available, was sanctioned some years back, but the project was set aside in favour of a new bridge. The design for a new bridge was rejected by Government on account of the cost, and both projects may be considered to have been abandoned. I propose to omit any notice of them in future Budgets.

Item 54, Statement 2 of Budget for 1856-57.

The improvement of the Dasgaum Khind on this road was completed on 10th June 1856; the parapet dry stone walls to the Parr Ghaut having been finished on the 8th May 1856.

Items 114 and 115, Statement 2 of Budget for 1855-56.

The bath-rooms and necessaries to the Travellers' Bungalow at Poladpoor were finished on 12th January 1857: an excess of expenditure was incurred on these buildings of Rs. 280-10-7. A dry stone wall has been built round the Travellers' Bungalow at Mahar.

Item 116, Statement 2 of Budget for 1855-56.

The branch road from Roha Bunder on the Rewadunda River to Kolad, 7m. 2f. 124y., was expected to be completed with culverts and drains before the monsoon, the earth-work being all finished. Lieutenant Fuller's estimate for kerbing the road, Rs. 5,069, has not been sanctioned.

Estimate Rs. 18,587.

A masonry Bunder in connection with this road has been commenced by the same Contractor who is building the drains.

Estimate Rs. 8,450.

The connection of the road to Nagotna with the Bunder-head was completed on 31st October 1856.

A survey of a proposed extension of the Nagotna line to Dhurumther Ferry has been made by Lieutenant Fuller.

A survey of the country from Nagotna to Parr is also in progress, with the view of selecting an improved line of road before estimating for the necessary bridges and culverts.

6. The Bunders at Dhurumther on the two opposite banks of the Nagotna River are complete. The road from the Bunder to Poinar, 2m. 4f. 62y. was opened at the close of last monsoon, a supplementary estimate for Rs. 6,915 having been sanctioned. The kerbing of the road has been since separately sanctioned and is in progress by contract; the aggregate sanctioned sum for this short distance being Rs. 15,164. Lieutenant Fuller has prepared designs and an estimate for prolonging this road to Alibaug, a distance of nine miles. For a continuation of the road from Dhurumther in the opposite direction *viâ* Penn to Khapoolee, Lieutenant Fuller furnished plans and estimates in October last, which were submitted to Government; but the importance of the line was not considered sufficient to warrant an expenditure of Rs. 3,61,008 on twenty-three and a half miles of road. A proposal by Lieutenant Fuller, that a portion of six miles of the road from Dhurumther should be sanctioned for insertion in the next Review Statement, has since been laid before Government (No. 4807, of 7th September 1857).

The branch road from this line to Wasee, 3m. 1f. 66y., was opened for traffic after last monsoon. Since then the kerbing of the road has been sanctioned, and is

Item 112, Statement 2 of Budget for 1855-56.

in progress by contract. The original sanction of Rs. 9,998 was found insufficient by Lieutenant Fuller, and he submitted a supplementary estimate of Rs. 3,445. The aggregate sum sanctioned is Rs. 16,014.

Lieutenant Fuller hopes to prepare plans and an estimate for a continuation of this road to the confluence of the Penn and Nagotna Rivers, in time for the next Review.

7. In September 1855 an extraordinary expenditure was sanctioned for a coating of broken stone, 5″ deep, to six miles of the road from Panwell to Khapoolee. Lieutenant Fuller reports that he was not able to commence this repair till January last, and that on account of scarcity of labour caused by the competitive demand of the Railway works on the Bhore Ghaut, he would not be able to prepare metal for more than two miles before the monsoon, which metal he proposed to apply to the worst portion of the road. In the mean time deficient portions of kerbing had been made good, and 167 yards of the road near Chouk raised two feet, as preparatory measures.

Item 112, Statement 2 of Budget for 1856-57.

The Barrogaum Bridge on this road was opened on 30th September 1856, and completed on 2nd December. An excess above the original estimate, of Rs. 4,243,. was incurred and sanctioned, and Lieutenant Fuller states that there was a further small expenditure of Rs. 70-4-11, making, with the original estimate, a total cost for this bridge of Rs. 9,535. Additional expense was incurred in lighting the old bridge until the opening of the new structure.

Item 108, Statement 2 of Budget for 1856-57.

Rs.	5,222
	4,243
	70
	9,535

Of the four causeways with culverts which were sanctioned at the same time with the Barrogaum Bridge, one had been opened near Khapoolee, in an unfinished state, on the 18th July 1855; the other three were opened at the commencement of last monsoon. The original estimate, Rs. 7,517, for these causeways, was exceeded by Rs. 4,015-15-6, the total cost of the four causeways being Rs. 11,533. But there was a further expenditure in making and

Item 109, Statement 2 of Budget for 1856-57.

Rs.	7,517
	4,016
	11,533

maintaining a temporary metalled road below each causeway until the opening of the latter.

Between Oolwa and Panwell, 6m. 1f. 130y., the road was originally constructed by Callianjee Sewjee, the Mail Contractor, in a very inferior manner. It has been improved and kept in a passable state for some years by the Executive Engineer, at the cost of Government. Two of the drains which gave way were rebuilt last year, and the rebuilding of eight more has been sanctioned, at an estimated cost of Rs. 893, as they were reported to be in a dangerous condition.

Government Resolution No. 937, 2nd April 1857.

The planking, railing, and other wood-work of a bridge near Panwell were partially renewed in 1856-57. Wooden bridges are a constant source of expense, and also of anxiety, for they are never safe.

A line from Oorun to Panwell has been surveyed by Lieutenant Fuller, with a view to estimating for a made road, with an iron swing bridge on the creek at Belpara. The salt traffic on this route is stated to be considerable.

8. A raised and bridged road on that portion of the line between Panwell and Tanna which extends from Tulloja to Pursik, about twelve miles, was sanctioned in January 1855, and the earth-work of the first mile was thrown up and kerbstones were collected for that distance. A contract was given for the execution of the work, but it was found that Mr. R. Scott, who framed the estimate, had not furnished details from which any specification of work could be framed. A postponement was unavoidable till a proper survey and levellings could be obtained. These were made during last cold season, by Mr. Robins, Sub-Assistant Executive Engineer, who has also prepared a fresh estimate of the cost; but the estimate was returned by the Acting Superintending Engineer for revision in some particulars. The road from Pursik to Tanna, about four miles, of the abovementioned line, has been made for some years.

Item 56, Statement 2 of Budget for 1856-57.

Lieutenant Fuller has now formed an opinion that the line from Panwell to Tanna is no longer sufficiently important to require the construction on it of an expensive first class road, and having expressed

my concurrence in this opinion, I recommended in a letter, (No. 4807, of the 7th September 1857) in which the construction of a part of the road from Dhurumther to Khapoolee was advocated in preference, that the sanction for an expenditure of Rs. 74,414 on the road from Tulloja to Pursik should be withdrawn.

9. The construction of a portion of the road between Tanna and Ghorebunder, namely, from Capoor Veer to Chiney Khind, about five miles, was sanctioned in December 1854. It appears from Lieutenant Fuller's report that the earthwork of four miles is completed, that one mile is kerbed, and that kerbstones for two and a half miles more are collected. But in the execution of these works the sanctioned amount has been expended, and Mr. Robins was to prepare a supplementary estimate, which will be submitted whenever it may be received. Another estimate for carrying on the road to Ghorebunder was also expected.

Item 57, Statement 2 of Budget for 1856-57.

10. The completion of a road through the town of Bassein to the Bunder, 1m. 6f. 39y., sanctioned in August 1854, from the Ferry Funds, has been effected; but the amount of compensation to certain landholders was still unsettled. A large drain has been since made under the road from Messrs. Littlewood and Company's property, and a protecting slope of dry rubble to the natural bunder at Bassein was expected to be completed before the monsoon.

Item 124, Statement 2 of Budget for 1855-56.

The new well in the compound of the Travellers' Bungalow at Bassein was finished on 17th May 1856.

11. The maintenance of the road from Coorla towards Vehar so far as the site of the Lake, has entailed of late a considerable expenditure, in order to provide for the carriage of the heavy iron castings used on the Vehar Water Works. Estimates of Rs. 5,317 for metalling these few miles of road, which were formerly of moorum, have been followed by a supplementary estimate of Rs. 5,789, and in the meantime the road was kept in repair by emergent disbursements independent of these estimated sums.

Rs.	4,436
	881
	5,317

12. When the viaduct for the Railway over the Tanna Creek was completed, the channel left for the passage of boats was found to be inconvenient and even dangerous, and it became necessary to improve it by blasting away the impeding rocks. The expense of this operation ought to have been defrayed by the Railway Company, but as the Superintending Engineer had not made any stipulations for securing a sufficiently commodious passage to boats, the obligation to do so devolved upon Government. The clearance of a proper passage was estimated at a very considerable sum. It was decided therefore by Government that some of the most objectionable obstructions only should be removed, and Lieutenant Fuller reports that the removal would be completed within a few days after the close of the official year.

Item 120, Statement 2 of Budget for 1855-56.

Estimate Rs. 5,596.

The cleansing of the Masoonda Tank at Tanna is reported to have been effected, together with one of the additional works consequent thereon, namely the digging of a waste channel. Over this channel it was found necessary to throw two wooden foot-bridges, while the road required protection for man and beast from the adjacent channel by a chain and posts. These works were expected to be finished before the monsoon. Mr. Robins reports that a liberal Native of Bombay has sunk a well in the tank, and the Collector has asked to be furnished with an estimate for another well in the tank. The original sanction for cleansing the tank being 500 Rupees, the supplementary estimate has been Rs. 1,115.

The Travellers' Bungalow at Tanna has been fitted with glazed and venetian casements.

The Post Office at Tanna has been enclosed with a ditch and mound.

For Ferries in the neighbourhood of Tanna two rafts have been completed, and a third raft is nearly ready.

Furniture has been supplied for the Offices of the Assistant Executive Engineers at Tanna and on the Agra Road.

13. Throughout the Tanna Collectorate the Travellers' Bungalows have been fitted with shelves and pegs and supplied with teapoys.

The horse-boats at the Ghorebunder and Datewra Ferries have been thoroughly repaired.

14. In the Revenue Department the following works have been executed during the year 1856-57 :—

A Bungalow at Alibaug for the Sub-Collector of Colaba was begun on the 11th January 1857, and it was hoped by Lieutenant Fuller that the building would be roofed in before the fall of any heavy rain.

Government letter No. 76, of 9th January 1857. Estimate Rs. 5,695.

The Mamlutdar's Cutcherry at Poinar had been put in repair.

The sanctioned additions to the Office of the Deputy Commissioner of Customs at Oorun were commenced on 18th March 1857, and expected to be roofed in before the occurrence of heavy rain. This work was delayed, the original estimate being insufficient, till an additional sum was sanctioned on the 5th March.

Item 221, Statement 2 of Budget for 1856-57; and Government letter, No. 657, of 5th March 1857.

The foregoing remarks are applicable to the new Cutcherry for the Sir-Carkoon at Oorun, commenced on 1st April 1857.

Item 222, and the same Government Letter.

As also to the new Cutcherry for the Sir-Carkoon at Trombay, commenced in April 1857.

Item 226, and the same Government letter.

The roof of the Deputy Commissioner's Bungalow at Oorun has been taken off and restored.

The roofs of the Collector's Bungalow at Tanna have been in like manner restored, and other extensive repairs effected.

Fourteen Chowkies at the Salt Works in Salsette were expected to be completed before the rains.

Item 220, Statement 2 of Budget for 1856-57.

The works for the restoration of the bed of the Wasee Creek, and protection of the banks in order to secure the dam, were completed on the 18th February 1857. A sum of Rs. 1,252-8-3, disallowed by Lieutenant Fuller in the accounts of Surveyor Gungaram Balajee, who superintended the construction of the Wasee Dam, has been passed after a lengthened and very troublesome investigation, and debited to that work, which was completed in 1852-53. The sluice gates of this dam are opened and shut yearly by the Public Works Department.

15. In the Judicial Department, a Moonsiff's Court-house at Moorbar was commenced in October 1856, but the estimate being found insufficient, a supplementary estimate of Rs. 933 has been submitted for the completion of the building.

Item 364, Statement 2 of Budget for 1856-57.

Wooden ceilings have been made to the prisoners' rooms in the compound of the Magistrate's residence at Tanna.

The Court-house at Dhanoo, built about four years ago, according to Lieutenant Fuller, has been so closely encroached on by the sea, that it has been found necessary to remove it and build a new Court-house, for which Mr. Robins has selected a site, facing a creek, where the ground is firm and the bank protected by an old sea wall, "built when the fort was erected some 150 years ago."

16. In the Military Department, privies for the Native Infantry detachment at Tanna were long ago sanctioned, but the site was objected to by the Assistant Commissioner of Customs. Lieutenant Fuller reports that an estimate for erecting them along the main channel and on the further side of a small island is in hand, but that this change of site will involve a heavy expenditure, as a bridge over the side-channel, high enough to allow the passage of boats, must be erected.

Item 411, Statement 2 of Budget for 1856-57.

An earthenware pipe drain has been laid to carry off the waste water of two wells in the Military lines at Tanna.

A shed has been constructed for the Bhistees and sweepers of the Military Hospital at Tanna.

The erection of a crane, similar to those on the Apollo Pier of Bombay, was completed at Oolwa Bunder on the 28th February 1857, for the use of the Commissariate.

Item 449, Statement 2 of Budget for 1856-57.

17. Under the head of repairs Lieutenant Fuller states, I observe, that 94m. 1f. 48y. of metalled roads, and 199m. 210y. of moorum roads, are repaired in the Tanna Collectorate.

He proceeds to furnish a list of important works remaining to be done in the Collectorate, which have either not yet been sanctioned or for which projects and estimates have not yet been submitted. It

seems unnecessary that I should repeat or remark upon this list. The proposed works are all either roads or bunders, or masonry works connected with the former.

18. Lieutenant Fuller's report of the manner in which his Assistants and himself have been employed during the year 1856-57, is briefly summarised below:—

Lieutenant Dickens, of Her Majesty's 64th Regiment, joined Lieutenant Fuller in February 1856, almost immediately after which he went to Mahableshwur on sick certificate and there remained till the monsoon. He then had charge of the repairs to the metalled roads in Salsette and to the Agra Road. He was ordered to join his Regiment, and proceeded to Persia, just as the working season commenced. Five estimates were prepared by Lieutenant Dickens while employed in the Tanna Collectorate.

Lieutenant Henry, Her Majesty's 86th Regiment, joined Lieutenant Fuller in the middle of the rains, and relieved Lieutenant Dickens from the superintendence of repairs to the roads in Salsette. He also superintended the draining and cleansing of the Masoonda Tank at Tanna. He prepared two estimates while employed under Lieutenant Fuller.

Lieutenant Browne, Engineers, joined Lieutenant Fuller on 21st November 1856, and had charge of the new road on the Agra line between Wassind and Khurdee, and for some time of the Tanna Road, but was relieved of the latter by Mr. Robins. Lieutenant Browne has furnished eleven estimates and four plans, taken levels of three watercourses, and laid out six miles of a new line of road between Colsette and Wassind (Agra Road). He has travelled on duty 709 miles.

Mr. Robins, Sub-Assistant Executive Engineer, joined in November 1856, having been specially appointed to make the survey of the line from Panwell to Pursik. He marked out that line and took the levels, while Mr. Wainwright prosecuted the survey and drew the plan, which was submitted with an estimate, for the road from Tulloja to Pursik, about half the distance. In February 1857 Mr. Robins took charge of the Tanna Division. He selected a site for the Dhanoo Court-house:

he has furnished four reports and twelve estimates. He has also, he states, personally superintended the payment of all the work-people employed by him (a most important duty, often delegated to subordinates). Nine hundred and ninety miles have been travelled by him on duty.

Serjeant Cheetham, Overseer, has superintended the execution of eight considerable works. Lieutenant Fuller adds, "Serjeant Cheetham has performed all the work entrusted to him to my entire satisfaction, and has travelled 3,020 miles."

Mr. Wainwright, Sub-Assistant Surveyor and Builder, surveyed the line between Panwell and Pursik and drew the plans, which occupied him three months. He then rejoined the Executive Engineer's Office, Ahmednuggur. "Mr. Robins gives a good report of him."

Annundrow Bappoojee, Surveyor and Builder, was engaged on the survey and plan of the country between Alibaug and Dhurumther, which occupied him an unreasonable time, and his drawings were so dirty, that Lieutenant Fuller was obliged, as he reports, to draw the fair plan himself. From the opening of the working season till February the Surveyor had charge of the building of the Moorbar Cutcherry. He then made three surveys on the Agra line of road, aggregating forty-three miles. Lieutenant Browne reports that this Surveyor's capabilities are good, but that he is "indolent," and his surveys "not always to the depended on;" that he draws fairly but cannot sketch ground.

Govind Moreshwur, Assistant Surveyor and Builder, was occupied till after the monsoon in a survey of the country between Nagotna and Dhurumther, and in plotting his survey. He was then put to superintend the finishing of the masonry works on the Agra Road between Khurdee and Kussara. From January he was employed on surveys of the Agra line, of which he completed and plotted twenty-four miles. Two estimates were also furnished by him. Lieutenant Browne reports that this man is industrious, and surveys more correctly than Annundrow Bappoojee, but has no idea of sketching ground and is no draftsman, and has but moderate ability; that he is useful in superintending works.

Raghoba Hurjee, Assistant Surveyor and Builder, has been under Mr. Robins, who reports that the Assistant Surveyor's time "has been entirely engrossed in preparing the supplementary estimate of the Chiney Khind road," which, Mr. Robins adds, "is the most incomplete document he ever saw." Ragoba Hurjee has nevertheless, I see, made eighteen estimates, surveys, and reports, and superintended the cutting of the waste channel to the Masoonda Tank. Mr. Robins reports his concurrence with Lieutenant Cotgrave's opinion, given in the preceding year, that this Assistant Surveyor is deficient in zeal and activity. Lieutenant Fuller promises a special report regarding the Assistant Surveyor's conduct.

Raghoba Shunkurjee, Boat-builder, is highly spoken of by Mr. Robins, under whom he was employed, for "his diligence and zeal." He was sent to Lieutenant Fuller for the purpose of building rafts, four of which he has prepared. But he has also superintended the construction of fourteen Salt Chowkies on Salsette, and thirteen petty works and repairs, and has prepared a plan and estimate for a horse-boat, and three other estimates.

Mr. Walker, formerly a Serjeant in the Sappers, remanded to the Artillery for drunkenness, but stated to be since reformed, has been employed by Lieutenant Fuller, since March, to superintend the new line of road from Wassind to Khurdee. He has been in weak health and seems to be of little use, but has conducted himself steadily.

Shivram Shayenna, Sub-Assistant Surveyor and Builder, joined Lieutenant Fuller from the Poona School on 15th December 1856, and has been employed in the Executive Engineer's Office in making thirteen tracings, four plans, and nine estimates. Lieutenant Fuller states that "this Surveyor draws very neatly, and I have found him useful in that respect, as also in preparing estimates and examining calculations." Not employed on out-door duties.

Bhavoo Sudasive, Sub-Assistant Surveyor and Builder, also from the Poona School in December, had examined an estimate and traced a plan in the Office. He then surveyed and plotted the road from Mahar to Nagotna (forty miles) and prepared three repair estimates

after inspection of buildings. Lieutenant Fuller considers that this man has "done a fair amount of work."

Hurree Bullal, Sub-Assistant Surveyor and Builder, also from the Poona School in December, traced three plans in the Office. He then made three surveys of ground which he plotted. Lieutenant Fuller states that Hurree Bullal can survey with the prismatic compass and chain, but has no idea of sketching ground.

Lieutenant Fuller records of himself that he has travelled 660 miles by railway, 1,116 on horseback, and 172 by boat, and that he has devoted eighty-seven days specially to travelling for inspection of works in the Collectorate. He appears also to have taken levellings for twenty miles of road, and for an aqueduct; to have marked out works on the ground, and to have prepared several plans and estimates; in short to have been very actively employed in person, as well as in the superintendence of his Officers.

19. Lieutenant Fuller, in closing his report, remarks that he finds "great difficulty in procuring a proper staff of efficient Maistrees for the conduct of works," and expresses a hope that "the time is not far distant when that class of useful men will be placed on a permanent footing."

I have the honour to be,
My Lord,
Your Lordship's most obedient Servant,
C. Waddington, Major General,
Chief Engineer of Public Works.

NASSIK AND PEINT STATE.

No. 302 of 1857.

PUBLIC WORKS DEPARTMENT.

Executive Engineer's Office, Nassik, 15th June 1857.

From Lieutenant A. W. H. FINCH,
Acting Executive Engineer Nassik and Peint State,

To the SUPERINTENDING ENGINEER CENTRAL PROVINCE,
Poona.

SIR,—I have the honour to submit the following annual report on the progress of the several works carried on in the Nassik Districts during the official year ending 30th April 1857.

2. To assimilate, as much as possible, the last annual report in the order in which the works occur, I shall commence by stating the particulars of those executed and referring to the trunk line.

Bombay-Agra Road.

3. There was little remaining to complete the actual roadway and bridges on this line at the termination of last season. The Wuzur Bridge and road deviation were described as considerably advanced, and these works have this year been completed and opened out to traffic, rendering thereby the extent of this line of communication in the Nassik District fully provided with bridges across all the nullahs and streams, with the exception of the Kadwah and Godavery Rivers.

Metal has also been spread and the road in every way finished on the twenty-three miles extending from Pimpulgaon to the Candeish boundary; the eighty-two miles of distance are thus perfectly prepared as "a finished metalled road," with the exception of eight miles between Pimpulgaon and Wuzur, for which length the material is in readiness to be spread as soon as the rain falls.

4. The additional works immediately connected with the Bombay-Agra Road, and sanctioned with a view to establish a ready supply of water for the use of cattle and travellers, are the construction of seven tanks as per margin, and the excavation of numerous wells at intervals along the line. The tanks have already been separately described, and reported upon as sufficiently advanced to enable them to store up water during the monsoon of 1856, so as to make their utility felt at the earliest possible date. In every instance, with the exception of the Lenna Tank, which was scarcely so advanced as the others, there has been a copious and continued supply during the whole season, which has lasted out and been sufficient to meet the extensive demands of the heavy traffic up to the most advanced period of the hot weather. The benefits derived from the restoration of these works have been very great, and their construction cannot but tend to allay, to a very considerable degree, the immense suffering that originally existed owing to the deficiency of the supply of water.

Chandore Tank.
Lenna Hill Do.
Willowlee Do.
Khamballa Do.
Warrewara Do.
Thullegaon Do.
Geernara Do.

5. I may mention as one instance, to show the extent of the boon conferred, that last year, at Chandore, the want of water was most excessive, in addition to the requirements of the traffic. There was only one well, worked at the expense of a native of the place, which had to meet the demands of providing for the wants of most of the inhabitants of the town, and the bullocks were led a considerable distance from the road to obtain a scanty allotment, so regulated in order to prevent the well being dried up. The construction of the tank (now complete) has prevented the recurrence of a similar dearth existing during the past season; the supply, emanating from springs, is very abundant, and unfailing at any period of the year. The Desmook of the place expressed the feelings of the inhabitants as most grateful to Government for the benefit that they themselves, in conjunction with the travellers along the road, have derived by the restoration of this work.

6. Four of the tanks are entirely complete, the others almost so; the work executed during the season having been the providing

and finishing the several portions of the masonry escape walls, and increasing the dimensions of the earthen embankments by a further excavation of the deposit from the interior. The latter work, owing to its progress being dependant on the diminution of the water in the work, has necessarily been somewhat retarded.

7. For the provision of drinking water, more especially for travellers, eleven wells have in all been cleared and excavated during the season; others are in progress. Their particulars are specified in the accompanying Statement, which also shows the expenditure incurred on each work.

8. It will thus appear that the section of the Agra Road in the Nassik District is well nigh rendered complete, as well in the several particulars relating to the ease and comfort of the travellers frequenting this route, as in the actual requirements for making the road in every respect a finished and perfect line of communication.

9. Only two spots occur on the line at which permanent means of crossing have not been prepared, viz. the Kadwah and Godavery Rivers. The former presents the greatest difficulties to the construction of a bridge, owing to the large proportions that it would be requisite to give the structure to allow of the passage of the immense volume of water brought down by this stream. The cost of the work has been estimated at Rs. 76,197; and with the near prospect of having a Railway traversing for the most part a similar line of country as the Bombay-Agra Road, its construction would only serve as a temporary convenience, and scarcely be worthy of such a heavy outlay.

10. At the Godavery River, however, a bridge could be thrown across for little more than half the above sum, and its formation would be attended with considerable benefit conferred on the inhabitants of Nassik, and it would also have the advantage of making a complete junction of the five lines of road that diverge from this town as a centre.

Nassik and Poona Road.

11. Adverting to the cross roads in the District, the one of most importance is the "Nassik and Poona," which, till recently, extended

thirty-two miles, but has now had a further addition of nineteen miles included in the length of road in the Nassik District. Almost the entire portion of the roadway has been made between Nassik and Poona, but much remains to be done in providing the masonry works to render this line of communication complete. An expenditure has been incurred of Rs. 3,176-15-11, during the last season, in the construction of drains on the section between Sinnur and Nandoor, and the roadway, extending twelve miles, was consolidated during the last rains and immediately afterwards opened for traffic. Its state during the whole season has been very satisfactory, and the inconvenience attending the descent to the nullahs occurring on the line has been much diminished by the formation of easy approaches, which have always been kept in good order. The works, including the construction of the Sindeh Pulset Ghaut and several bridges, requisite to finish this road to Nandoor, have obtained the sanction of Government, and will be considerably progressed with during the ensuing season.

Nassik and Bulsar Road.

12. The Nassik and Bulsar Road may be said to be a continuation of this line, extending from Poona towards the Coast and Surat. It has, during the past season, been completed to Peint, a distance of thirty-two miles, and the completion of the several masonry works, including five small bridges, renders the communication uninterrupted along the whole distance to the Sawul Ghaut (twenty-three miles). Below the Ghaut to Peint, two large streams and some of smaller size yet remain, to complete, in a perfect manner, the whole length of road, which otherwise is finished and in good order. Estimates for these will be prepared and submitted at an early date.

13. An additional extent of eight miles to Rajbaree terminates the portion of this road under the Nassik charge; beyond it is under the control of the Surat authorities. The distance just referred to, though unmade, is situated across a level country, and kept clear and without obstruction, for the transit of the Surat Post, which it is proposed to convey shortly by this route. The road will be permanently executed next season.

Nassik and Hursool Road.

14. The next road to be described is an entirely new work, and one that has altogether been constructed during the past year, "the Nassik and Hursool Road." Though a portion of the amount expended on this work has been defrayed from the Imperial treasury, providing for the formation of the road to the limits of the Peint State, beyond which the outlay is borne by the Peint revenues, the principal benefit derivable is confined to the latter District.

15. By the construction of this road the whole of the southern Mahals of the Peint State, which to the present period had no means of communication either with the high lands of the Deccan by the intervention of the western range of Ghauts, or more indirectly by the line of road extending to the town of Peint, on account of the excessive ruggedness of the country situated along the foot of the same range of hills, is now rendered quite open and connected with Nassik by a road scarcely extending thirty miles.

16. An easy means of carriage, to convey the timber from the best growing part of the Peint State to Nassik and other large markets in the neighbourhood, is perhaps the most important advantage that will attend the opening out of this line; but the considerations of connecting parts of the country hitherto completely debarred and entirely shut out from intercourse with more civilised localities, will not be the least beneficial result that will accrue from this work.

17. The first section of the road, extending from Nassik to Laselgaon, ten miles, has been constructed under Mr. Parker's superintendence. Owing to the country being generally level and liable to be covered with water in heavy rains, the roadway is raised and of a substantial section, with a good surface layer of moorum spread. More attention has been paid to complete this portion in a finished manner, as there is a considerable traffic already developed between Nassik and the large village of Gungapoor and other considerable-sized villages situated on this locality. At the village of Savergaon the road crosses the Godavery River, easy descents to which have been constructed, and for which purpose considerable excavations were necessary to be made.

18. As the road recedes from the Godavery Valley it enters into a part of the country rugged and disclosing nothing but a succession of hills. The old track was especially difficult, carried over abrupt and dangerous projections running out from the range of hills, and all but impassable for any cart.

19. On a minute examination of the country, it was found impossible to construct a road by this route, which was more readily abandoned as the deviation now taken has the increased advantage of diminishing the direct distance very considerably. The line adopted traverses along the foot of a range of hills to the village of Mahloongi, where a large tributary of the Godavery is crossed, and immediately afterwards the short Ghaut range, described as offering such imposing difficulties to the route by the old track, is here ascended by the Mahloongi Ghaut, over which the road has been taken at an uniform inclination of 1 in 20. The nature of the soil fortunately was very favorable for a road-cutting, and the work was carried out without the slightest difficulty and in a remarkably short period of time. The road here is twenty feet wide, and extends along the Ghaut for a distance of 1 mile 400 yards.

20. From the summit of this range of hills to Waghera, a distance of eight miles, the country is broken and generally comprised of the barren and hilly nature of ground that is always to be found in the neighbourhood of the Ghauts. By keeping, however, along the foot of the several spurs and projections that jut out from the main range, a very favorable line has been secured; and though at portions the undulations of the country made requisite a large amount of cutting and filling to obtain a proper gradient for the road, no very considerable difficulty was met with in executing this particular section.

21. At Waghera terminates the length of road, twenty miles, that has been constructed from Government sanction; and it is at this point where the Suttee Ghaut commences, the formation of which, and the extension of the road to Hursool, is included in the Peint State, and has been provided for by a sum set apart for this purpose out of its revenues.

Suttee Ghaut.

22. The commencement of this work was described in the last annual report. The line was laid out in March 1856, by Colonel Scott, and, immediately after, its construction was commenced and carried on under Serjeant Williams. During the season, about four miles of road, with a width of twelve feet, had been completed. This year the whole line, extending six and three-quarter miles, has been made, and the original width increased to eighteen feet, which is now the average dimension throughout the whole Ghaut. The material excavated has generally consisted of large boulders imbedded firmly in earth and moorum, which, from their requiring to be separately loosened and removed independantly, took up considerable time and labour in the execution of the work; and a large amount of blasting was also necessary in removing large pieces of stone and rock: altogether 952 lbs. of powder have been consumed in this operation.

23. The plan adopted in the execution of the work has been to allot lengths of roadway, varying from half a chain to thirty chains, according to the nature of soil, and give the same in contract to Beldars, of whom there are always to be found an immense number in this District. Each allotment was purposely given of a short length, in order that there might be no delay in the execution of any particular individual's portion, and on the completion of which he received fresh work in advance. The rates for excavating all description of materials varied from three to fifteen annas; the latter figure comprising a large portion of blasting included in the work. In every case these prices gave satisfaction to the workmen, and though there were upwards of 2,000 people collected on the works, nothing but good order and contentment prevailed during the whole period it has been in progress.

24. To Serjeant Williams is entirely due the credit of having carried out this important work in the efficient and expeditious manner it has been executed; and a more intelligible idea of its dimensions, and the difficulties attending its construction, may perhaps be gathered, when I state that the Ghaut Road, extending six and three-quarter miles, and forming a communication between points with a difference in

height of upwards of 800 feet, has been constructed (taking the clear period employed) in the short space of six months. In this period of time there has necessarily not been opportunity to build all the masonry works and drains. Altogether nine culverts have been erected, in a finished manner, with average width of waterway of seven feet; over the remaining watercourses temporary arrangements have been adopted by throwing across felled trees and placing over them a layer of materials, well packed, till such time as the more permanent work can be executed. The road again proceeds from the foot of the Ghaut to Hursool, at present the termination of the line and the principal village of the north part of the Peint State.

Irrigation Works.

25. It will be needless to describe in detail the particulars of each of the works included under this head. The Bundaras that up to the present time have been repaired and made complete for irrigation, are built generally over streams small in size, but well adapted, by the continued flow of water in their beds, for the purposes of irrigation.

26. In most cases the repairs executed has only preserved the original amount of irrigation, but which, from the state of the works, was gradually diminishing; and in some cases the dilapidated condition of the dams had been the cause for neglecting entirely the Bagayet cultivation, and only growing the dry land crops on ground which formerly had been laid under water.

27. From the extension of these works over the District, the people appear to be thoroughly impressed with the benefit they derive, and, general speaking, express their acknowledgments for the liberal assistance they have received from Government in renewing and restoring these decayed Bundaras. It is principally in the neighbourhood of Sinnur, where the largest amount of work relating to irrigation has been executed, that the villagers, slightly apart from that locality, have been imbued with creditable feelings of jealousy, and come forward with petitions entreating that similar favours might be extended to their own particular District.

28. The principal points that required attention in the renewal of most of the Bundaras, was the adoption of proper arrangements for securing the extremities of the dams from being turned by the sudden rush of the river floods. In every case screen walls have been provided at the entrance of the channel, and thus means provided to regulate the supply into the watercourse; and further, on the opposite side of the dam, in instances where the bank was not composed of rock or very durable material, flank walls were erected to secure the work at these parts.

29. Including those commenced last season, thirty Bundaras (enumerated in the accompanying Statement) have been completed during the year. Of the whole number, five are strictly speaking new works, the masonry dams being built on the original or distinct sites, to preserve the irrigation being dependant on temporary works, or, as in some cases, totally abandoned by the extreme dilapidated state of the Bundaras.

Establishment.

30. I must first take occasion to mention Mr. Latimer's services. This gentleman was appointed to the Office exactly a year ago, and as, at the time, he was not quite acquainted with all the duties requisite of an Assistant in the Department, he employed himself during the rains in perfecting himself in the branch of Engineering with which he was less intimate; and succeeded, by the termination of this period, to have a complete knowledge of the subjects relating to his work. During the season, he has been very extensively employed on survey duties relating to irrigation and road projects, and given very valuable aid in preparing the surveys of a number of schemes, which otherwise I could not have brought forward without his assistance.

31. I cannot state too strongly, or in too flattering terms, of the manner in which Mr. Latimer has this season executed his duties, or the interest and desire he at all times shows to give satisfaction; and it is very important that this should be borne in mind at the present period, as it will be remembered that lately Mr. Latimer has been described as not having fulfilled the expectations that were formed of his capabilities for the appointment he holds. Whatever before

might have been Mr. Latimer's incompetency for his duties, it is necessary to state that these do not exist now, and he is perfectly competent to superintend and carry out the several duties of an Assistant. He has this year surveyed and levelled ninety-one miles of road, and his several plans and papers testify to the correctness and attention he has devoted to the subject, and are alone sufficient to show the extent of his practical knowledge.

32. If I might be allowed to give expression to my own opinion regarding the position of Mr. Latimer, I certainly consider this gentleman has in every respect fulfilled the wishes of Government, and employed the period that was extended to him to make himself acquainted with his duties, to the greatest possible advantage; the best proof of which offers itself in adverting to the amount of work that has been executed by him this season, which could not have been surpassed by any person, however intimately he might have beforehand been versed in the duties. Even in the event of Mr. Latimer's theoretical acquirements not giving sufficient satisfaction to the Committee before which he has been apprised to appear, I should think his retainment in the Department would tend greatly to its interests, and that he will always prove efficient and able in the discharge of the duties he is at present occupied with.

33. For the actual superintendence of works there are two European Overseers, Mr. Parker and Serjeant Williams, attached to this Office; one Native Surveyor and Builder, Gunnesh Moreshwur, and three Native Overseers and Maistries, to whom the charge of smaller works is entrusted.

34. The execution of the most important work was divided between Mr. Parker and Serjeant Williams, and I am much indebted to them for the very efficient and zealous manner they have each performed their respective duties.

35. Mr. Parker's thorough knowledge of his profession, as well in the theoretical as in the practical parts, has been of the greatest assistance to me. The length of roadway in his charge was almost entirely laid out by himself, including the setting out and calculating the curves, which were rendered more necessary from the flat aspect

of the country. His qualifications, added to his extended experience in the Public Works Department, make him well worthy of promotion to a higher grade than he at present occupies, and I trust the application that has already been made urging this measure, will be successful in improving his position; and I am satisfied the interests of the Department will be much benefited by holding out inducement and rewards to the steady and deserving members in its subordinate branches.

36. It is no less my duty to place on record the excessive energy and attention devoted by Serjeant Williams to his work, the amount of which, that has under his supervision been executed, will better testify to the credit he deserves. He has constructed the Suttee and Mahloongi Ghauts, together extending six miles, and an additional length of roadway situated above and below the range of Ghauts, of ten miles. The control he exerts over the work-people, generally of a turbulent disposition, has alone enabled him without difficulty to carry out the very heavy and extended works that have been entrusted to his charge.

37. Gunnesh Moreshwur, Surveyor, was employed in the superintendence of some large metalling sanctions which were completed in February; he was then, at the Superintending Engineer's request, attached to the Tanna Executive Engineer, for the purpose of giving assistance in marking out the line of road below Khurdee, the locality in which he was originally occupied. On the completion of this duty, and since his return to Nassik, he has more or less been unfit for active employment by the weak state of his health, which I do not think will permit him to remain much longer in the Department.

38. The three Native Overseers and Maistries, Nursoo Venkoo, Sopandew, and Buyajee, have individually given great satisfaction, and carried out the works under their charge, consisting principally of Bundaras and irrigational works, efficiently and well.

I have the honour to be, Sir,
Your most obedient Servant,
A. W. H. Finch, Lieutenant,
Acting Executive Engineer, Nassik and Peint State.

No. 3714 of 1857.

Public Works Department.

Superintending Engineer's Office, Central Province, Poona, 23rd June 1857.

Transmitted to the Chief Engineer of Public Works, with reference to Lieutenant Southey's Memo. No. 12731, 19th December 1855. The Statement of Expenditure will be forwarded on receipt.

C. W. Tremenheere, Major,
Acting Superintending Engineer, Central Province.

No. 3880 of 1857.

Public Works Department.

Office of Chief Engineer of Public Works, Bombay, 23rd July 1857.

I submit the foregoing for the information of His Lordship in Council, as required by para. 5 of the Government Resolution under Mr. Secretary Hart's Memo. No. 1806, of the 27th November 1855.

Letter from Lieutenant Finch, Acting Executive Engineer Nassik and Peint State, No. 302, of the 15th June 1857, endorsed by the Acting Superintending Engineer Central Province, under date the 23rd idem.

2. The report should have been accompanied by some remarks from the Acting Superintending Engineer Central Province, but Major Tremenheere having so lately assumed charge of his office, and not having seen any of Lieutenant Finch's works, did not, I presume, find himself qualified to offer any.

3. Lieutenant Finch's report gives a clear and satisfactory account of the works executed under his superintendence during the year 1856-57. His Division of the Agra Road, eighty-two miles, he describes as being now well nigh rendered complete as a bridged and metalled road, with water for men and cattle. Two large projects alone remain unprovided for, viz. the bridging of the Godavery and

the Kadwah Rivers. The former project, which he thinks would not cost much more than half the sum required for the Kadwah, Lieutenant Finch recommends for execution. A bridge over the Kadwah, it is computed by Lieutenant Finch, would cost Rs. 76,197, and he considers this work unnecessary on account of the expected Railway. I propose, however, to call on Lieutenant Finch for designs and estimates of bridges for both rivers.

4. Lieutenant Finch has made the mistake of calling the Nassik and Poona Road a cross road (para. 11). It is part of one of the most important trunk roads in this Presidency. There are thirty miles of it in the Nassik District, of which twelve, between Nandoor and Sinnur, were opened in 1856, the eighteen miles from Sinnur to Nassik having been long since opened. The road between Nandoor and Sinnur still requires bridges, and between Sinnur and Nassik the formation on a new line of the Sindeh Pulset Ghaut. These works are provided for in Statement No. 1 of this year's Budget, Nos. 32, 33, and 34, at a cost of Rs. 60,996.

5. On the continuation of the Poona and Nassik line towards Bulsar, Lieutenant Finch reports the road as far as the Sawul Ghaut, twenty-three miles, completed with bridges. Below the Ghaut two large and several smaller streams remain to be bridged. With these exceptions, the whole length of road (Nassik to Peint, thirty-two miles) is finished. An extension of this line, eight miles further to Rajbaree, is under Lieutenant Finch's charge, and is kept clear for the dawk runners, but the road is unmade.

6. Lieutenant Finch styles a road which has been made from Nassik to Hursool "an entirely new work and one that has altogether been constructed during the past year." This is not quite accurate. The Suttee Ghaut on this line was partially opened in 1855-56, and some work had been done there before by Mr. Suart or Captain Mungavin. The nineteen or twenty miles of road, however, which are provided for by the British Government from Nassik to Waghera, including half way the ascent of the Mahloongi Ghaut, 1m. 1f. 180y., twenty feet wide, and at a slope of 1 in 20, have been made during last year. This part of the road is not described as being bridged in

Lieutenant Finch's letter No. 302, but in a former Progress Report, five wooden bridges and eighteen drains were enumerated. The descent of the Suttee Ghaut, in the Peint State, begins at Waghera, and has been completed with a width of eighteen feet and a gradient not exceeding 1 in 20. Nine culverts have been built on the Ghaut, the remaining watercourses being temporarily spanned by bridges of felled trees. The Ghaut road is now stated to be six and three-quarter miles long, and descends more than 800 feet. From the foot of the Ghaut, the road, we are told, proceeds to Hursool, but it is not here stated what the distance is, or whether the road be formed or only cleared and passable. In a former Progress Report, however, it was said to be 3m. 3f. from the foot of the Ghaut to Hursool, over a formed road twenty feet wide. I may observe, by the way, that Lieutenant Finch is not always accurate in his descriptions; he has furnished three Progress Reports relating to the same date, and they differ one from another as to distances and in many details. The Suttee Ghaut, in a former report, was stated to be 4m. 7f. long.

7. The irrigational works in progress have been restorations of Bundaras over small streams, "principally in the neighbourhood of Sinnur." Thirty Bundaras have been completed during the year, including those commenced in 1855-56. Lieutenant Finch observes that "from the extension of these works over the District, the people appear to be thoroughly impressed with the benefit they derive." What is more required for the guidance of Government, however, is, in my opinion, a careful inquiry into the cost of these works, and the increased return derived from them.

8. I have read with pleasure the very favorable terms in which Lieutenant Finch describes Mr. Latimer's services, and states his opinion of the perfect competency of that gentleman for the duties of a Civil Engineer. Mr. Latimer should now be able to appear before a Committee, as directed in Government Resolution under Mr. Secretary Hart's Memo. No. 507, of the 19th February 1857, without fear of failure. Mr. Parker's and Serjeant Assistant Overseer Williams' zeal and efficiency are also highly praised. The former has been recently promoted on Lieutenant Finch's recommendation. Serjeant

Williams' skill and energy in the construction of the Suttee Ghaut seem to deserve reward, and point him out as a fit person for promotion. I confess that I should have been more impressed by Lieutenant Finch's praise of his Assistants if not expressed in the very strong terms which he has used. With respect to three Native Overseers and Maistries on his establishment, Lieutenant Finch states that they have given him great satisfaction; but with regard to the only Surveyor under his orders, Gunnesh Moreshwur, he writes that the Surveyor's weak health made him latterly more or less unfit for active employment, and would probably not permit him to remain much longer in the Department. I shall make further inquiry regarding this man, and report the result for the information of Government.

C. Waddington, Major General,
Chief Engineer of Public Works.

AHMEDNUGGUR.

No. 642 of 1857.

Public Works Department.

Executive Engineer's Office,
Ahmednuggur, 6th July 1857.

To Major Tremenheere,
Acting Superintending Engineer, Central Province.

Sir,—I have the honour, with reference to the Government Resolution No. 1806, of the 27th November 1855, forwarded with Chief Engineer Public Works' Memo. No. 12731, of the 19th December following, and Superintending Engineer Central Province's Memo. No. 6112, of the 26th idem, to forward the following report.

2. Few works of importance have been undertaken during the past year in this Collectorate, nor do there appear to be any facts, in connection with those works, from which even the Officer by whom they were superintended could frame a report affording matter of interest to the *general* reader; much less therefore would it be possible for one who has only been in charge of the office for a few days, to submit a report on the proceedings of the Department which should furnish the information contemplated by the Government in their Resolution calling for these documents.

Nature of Work performed as regards Report required.

3. The only undertakings which can possibly be viewed as works of interest, are the roads and bridges constructed in this Collectorate during the past year, which I will attempt to describe.

Works of interest confined to Roads and Bridges.

The Emampoor Ghaut Road.

4. The Emampoor Ghaut (lying between Nuggur and Aurungabad), from the steepness of its slopes, presented so great an obstacle to the traffic on that line of road, that carts could with difficulty ascend the incline, and then

The Emampoor Ghaut Road, before improved.

only by the cartmen hiring other cattle, which were kept for this purpose at the foot of the Ghaut.

New Road over Ghaut.

5. It was therefore proposed to Government to construct a new road down the Ghaut, and a sum of Rs. 26,189 was sanctioned for this purpose. The road was commenced in the month of May 1855, and, although only reported to be completed on the 1st May 1857, yet the work was sufficiently forward in September 1856 to admit of its being opened for traffic.

The comparative merits of the two Roads.

6. The new Ghaut Road is a great improvement on the old one; the slope of the former being made 1 in 20 throughout, whereas, in some parts, the latter had inclines as steep as 1 in 6 and 7.

Difficulties encountered in constructing the Road.

7. In the formation of the new road a considerable quantity of deep rock-cutting was encountered, as also of excavation in hard moorum; yet the whole of the work was accomplished, with the exception of one bridge, in the course of a year and a half, by the creditable exertion of the Overseer employed in its construction.

Description of Road.

8. The road is made of an uniform width throughout of twenty-two feet in the clear, with side-channels varying from two to five feet in width. On the lower side of deep cuttings, protection walls of dry stone masonry have been constructed; and where the roadway has not been entirely cut out of the solid dry stone, retaining walls have been built upon the lower side, on which protection walls as above described have been formed.

Masonry Works.

9. The roadway is drained throughout by cross drains built of choonam masonry, but, being of small dimensions, they do not call for further notice here. One skew bridge, however, has been built, from the sanctioned amount for this work, providing four waterways of twenty feet span each, with versed sines of six feet. The whole of the structure is of roughly chisel-dressed stone, with the exception of the arches, which are formed of brick.

10. The surface of the roadway is covered with moorum and coarse gravel.

Road Surface.

11. Amount of estimate for this work is .....Rs. 26,189 0 0

Cost of Work.

Do. expended in 1855-56..	Rs.	15,678	5	7	
Do. do. 1856-57..		5,620	5	5	
					11,298 11 0
Balance of estimate.....	Rs.				4,890 5 0

Road between Emampoor and Toka.

12. In continuation of the Ghaut road above described, a gravelled road has been constructed as far as Toka, as follows:—

13. The roadway throughout is twenty-one feet in the clear, raised above the natural surface of the ground (which is composed for the most part of black soil) one foot, and over this moorum or gravel has been laid eight inches in depth.

Roadway how formed.

14. The whole of the small drains along the line, which are of coursed rubble and lime masonry covered with slab stones, have been completed.

Drains.

15. The amount sanctioned for the work is....Rs. 39,844 0 0

Cost of Work.

Amount expended in 1855-56..	0	0	0	
Do. do. in 1856-57..	19,182	11	6	
Balance of estimate..Rs.	20,661	4	6	

16. The line of road just described is intersected by several rivers, the principal of which cross the road at the village of Wuddulla, Handy Nimgaum, and Ghoregaum; the lesser streams crossing the road near Kurkee Murkee, Tassal, Ghoregaum, and Baboolwarra. Of these rivers two are being bridged, viz. the Wuddulla and Handy Nimgaum.

Rivers and Nullahs intersecting the Emampoor and Toka Road.

17. The designs for the bridges in course of construction were prepared by Lieutenant Southey, and provide in each case five arches of thirty feet span with versed sines of six feet; they are both built to the springing of the arches.

Designs by whom prepared, and Descriptions thereof.

Designs remaining to be prepared.

18. Designs for the remainder of the masonry works required along the line are in course of preparation.

Bridges in course of construction.

19. Estimated amount for the Wuddulla Bridge is Rs. 5,687 0 0
Amount expended in 1856-57 .. 2,633 13 8
Balance of estimate..... Rs. 3,053 2 4

Estimated amount for Handy Nimgaum Bridge is.. Rs. 4,626 0 0
Amount expended in 1856-57..... 2,360 6 8
Balance of estimate ..... Rs. 2,265 9 4

Bridges and Drains on the Poona and Ahmednuggur Road.

Designs of Culverts, &c. by whom prepared, and cause of Work being suspended.

20. Sanction was accorded by Government, on the 15th November 1855, to the construction of fifty-five small culverts and drains on the Poona and Nuggur Road, lying within the Nuggur Collectorate, on designs and estimates prepared by Captain Mungavin, while Acting Executive Engineer Ahmednuggur Collectorate. Twenty-five of the culverts were built by contract during the past official year, but on a representation made by Lieutenant Cotgrave of the insufficiency of the waterway provided, the work of the remainder was suspended, and more suitable designs have been called for. During the past two months Lieutenant Cotgrave's opinion has been fully verified; the approaches have been washed away, and in some instances the structures have received considerable injury: but I refrain from further allusion to these failures, seeing that they have occurred since the 1st of May last, the date on which this report became due.

Bridge over the Waghoonda River.

Situation of Bridge, and by whom designed.

21. This bridge has been built by contract, over a large river which intersects the Poona and Nuggur Road near the village of Waghoonda, and in accordance with a design and estimate prepared by Captain Mungavin.

22. The bridge consists of eight arches of twenty feet span each, with versed sines of six feet, and has been constructed throughout of roughly-dressed stone and choonam.

Description of Bridge.

23. This work has unfortunately failed since the 1st May, and special reports regarding the failure have been submitted.

Failure of Work.

24. Amount of estimate..... ..Rs. 7,072 0 0

Amount expended on Work.

Amount expended in 1856-57... 5,663 8 8

Balance of estimate .....Rs. 1,408 7 4

Metalling the portion of the Poona and Ahmednuggur Road in the Ahmednuggur Collectorate.

25. On the 26th January 1855 Government accorded their sanction to an estimate submitted for this work, amounting to Rs. 42,864, and the preparation of the metal was commenced on the 1st May 1855. Owing, however, to want of proper superintendence, instead of the amount sanctioned proving sufficient for breaking and spreading the metal along the whole line, a distance of 39 miles and 3 furlongs, it was found on the 30th of April 1857 that not only had the amount sanctioned been exceeded, but also that metal for only twenty-four miles had been collected on the roadside, and a quantity sufficient for half a mile more prepared at the quarries.

Sanction when accorded, Amount, and Cause of suspension of Work.

26. A supplementary estimate for completing the work has been submitted; but in the mean time the roadway is being much injured where the heaps of metal have been placed in the side channels, thereby preventing the drainage water following its prescribed course.

Supplementary Estimate submitted. Reason why the Metal ought to be removed.

27. The excess already incurred on the sum sanctioned amounts to Rs. 874-12-5.

Present Excess on Sanctioned Amount.

Other New Works.

28. The remainder of the works undertaken during the year 1855-56 are not of a nature to render any attempt at description in detail necessary; they are as follows :—

Remaining Works not of a nature to render detailed Report thereof necessary.

29. Alterations and additions to Artillery Barracks at Nuggur.

Amount of estimate				Rs. 59,598	0 0
Do. expended in 1855-56....	7,589	2	2		
Do. do. in 1856-57....	29,125	6	9		
				36,714	8 11
Balance of estimate.....				Rs. 22,883	7 1

30. Erecting four Barracks for Married Soldiers at Nuggur.

Amount of estimate				Rs. 72,265	0 0
Do. expended in 1855-56	371	4	0		
Do. do. in 1856-57	17,272	10	9		
				17,643	14 9
Balance of estimate.....				Rs. 54,621	1 3

New Works of small Cost.

31. Besides the works above enumerated, two small buildings have been constructed, on estimates sanctioned by Government, viz., a harness-room for the Field Batteries, at a cost of Rs. 1,575-7-1, and a necessary for the Artillery Camp-followers, at a cost of Rs. 750.

Miscellaneous Works.

Miscellaneous Works.

32. Numerous other works, such as additions and alterations, ordinary repairs to roads and buildings, and works executed on emergent requisitions from the Civil and Military Authorities, have been performed by this Department, during the past season; but as they are shown in detail in the Progress Report already submitted, they do not appear to require more special notice here.

Plans and Estimates.

33. A large number of plans and estimates have been prepared during the year 1856-57 and submitted for the sanction of Government, the most important of which are as follows:—

Estimate of Moorum Road from Elud to the Town of Yeola.

34. Forming a moorum road from Elud to the Town of Yeola, amounting to Rupees 1,30,265.

35. This estimate provides for a moorum road, twenty-two feet in width, and raised two feet above the general surface of the ground where it is composed of black soil; in other parts it is to be merely cleared and to have side-channels excavated on both sides. The estimate also provides for small cross masonry drains and paved dips. A layer of good moorum is to be spread over the roadway throughout.

Description of proposed Road.

36. The survey of this line has only been made as far as Yeola, a distance of sixty-two miles, instead of to the boundary of the Collectorate as directed.

Survey to what Distance carried.

37. An estimate for forming a moorum road from the foot of the Emampoor Ghaut to Pyton, a distance of thirty-seven and a half miles, amounting to Rs. 85,385.

Estimate for Road from Emampoor Ghaut to Pyton.

38. This estimate provides for a roadway twenty-one feet broad, raised with good moorum, where it passes over hard soil, to an average height of twelve and a half inches; where black soil is encountered the bank is to be raised to eighteen inches, and covered with a layer of moorum six inches in depth.

Description of proposed Road.

39. The estimate neither provides for kerbing nor the construction of cross drains; but it includes the cost of building culverts and bridges over all the large streams, with the exception of the Dora and Godavery Rivers.

Masonry Works provided for in the Estimate.

40. Rs. 21,697 have been sanctioned for a moorum road proposed to be formed between Ahmednuggur and Jategaum, a distance of thirty-five miles and three furlongs.

Proposed Road between Ahmednuggur and Jategaum.

41. An estimate for this work was prepared in this Office, amounting to Rs. 74,000, for making a more perfect road than what is now proposed to be constructed; but on the representation of Captain Meadows Taylor, Government considered the expenditure of so large an amount unnecessary, and accorded their sanction to an estimate prepared by that Officer, of the amount abovementioned.

Estimates submitted for the proposed Road by this Department and by Captain Taylor.

42. The sum sanctioned will merely admit of a cleared roadway, with side-channels and ramps leading into nullahs, being made.

Kind of Road contemplated.

43. A design and estimate were submitted for the construction of a bridge over the Goar River at Seroor, the latter amounting to Rs. 46,723.

Design and Estimate for Goar River Bridge.

44. A design and estimate for a bridge over the Seena River near Nuggur, amounting to Rs. 26,436.

Ditto for Seena Bridge.

45. Surveys and estimates for changing the direction of the old road at Seroor to meet the new bridge proposed to be built over the Goar River, at a cost of Rs. 38,730.

Survey and Estimate for changing Direction of Road at Seroor.

Estimates of minor importance, as below.

46. Revised estimate for a shed for punishment drill at Ahmednuggur, amounting to Rs. 1,024. Plan and estimate for a Bundara and irrigational channels at Narrayendoho in the Nuggur Talooka, amounting to Rs. 1,422. Estimate for constructing a toll house on the Emampoor Ghaut, amounting to Rs. 1,087. Estimate for outhouses for Married Soldiers' barracks, amounting to Rs. 2,580. Estimate for making sun-shades to the clerestory windows of the Artillery Barracks, amounting to Rs. 3,682; and estimate for putting up weather-boards over ditto, amounting to Rs. 4,435.

Establishment.

47. The following Establishment has been engaged in the execution of Public Works in the Ahmednuggur Collectorate during the past official year:—

Names of Individuals.

Acting Executive Engineer Captain Mungavin, for a period of 26 days.

Acting Executive Engineer Lieutenant Cotgrave, for a period of 11 months and 5 days.

Assistant Executive Engineer Lieutenant Sprot, for a period of 9½ months.

Assistant Executive Engineer Lieutenant Twyford, for a period of 5 months.

Permanent Establishment.

1st Class Surveyor and Builder Mr. Victor, for a period of 12 months.

Assistant Overseer Serjeant O'Connell, for a period of 12 months.

Assistant Overseer Serjeant Hanley, for a period of 7 months.

Sub-Assistant Surveyor and Builder Mr. Wainwright, for a period of $5\frac{1}{2}$ months.

Assistant Surveyor and Builder Bhasker Vittul, for a period of 12 months.

How employed.

48. And they have been severally employed as below :—

Captain Mungavin.

Captain Mungavin was employed exclusively in the performance of office duties for the short time he remained in the office during the past official year.

Lieutenant Cotgrave.

49. Lieutenant Cotgrave was engaged in superintending the extensive works in progress in the Cantonment of Ahmednuggur, as also the ordinary, petty, and emergent works at this Station ; in the investigation of irrigational works in the Talookas of Khurda and Ahmednuggur ; and in visiting the works in charge of his Assistant on the Aurungabad and Poona Road. Lieutenant Cotgrave also prepared designs for bridges over the Goar and Seena Rivers and for various other works.

Lieutenant Sprot.

50. Lieutenant Sprot was employed in clearing the road between Elud and Kopergaum for a period of three and half months, and for the remainder of the year in constructing the moorum road between the foot of the Emampoor Ghaut and Toka. While engaged in the performance of the last named work, Lieutenant Sprot was also directed to inspect some irrigational projects ; but, as might have been foreseen, one duty interfered with the other, and prevented his giving proper attention to the latter, so that the requisite surveys were never even commenced.

Lieutenant Twyford.

51. Lieutenant Twyford was employed in surveying the Nuggur and Jateegaum Road, including the Bhala Ghaut ; in preparing plans and estimates for

its construction; and in preparing designs and estimates for bridges for the Pyton Road.

Mr. Victor.

52. Mr. Victor was employed at this Station, under Lieutenant Cotgrave, in superintending the different works in course of construction, for a period of seven months; then in making the survey and preparing the plans and estimates for the Goar River Bridge; in preparing a survey, with designs of culverts, and estimates, for the proposed deviation from the old road at Seroor; and in levelling for irrigational projects in the Khurda and Nuggur Talookas. Mr. Victor was also engaged in executing ordinary repairs to the road between Nuggur and Poona situated in the Ahmednuggur Collectorate, and in the execution of other minor works.

Serjeant O'Connell.

53. Serjeant O'Connell was in charge of the works on the Emampoor Ghaut for a period of five months, after which he was attached to Lieutenant Sprot's office, and assisted that Officer in constructing the road from Emampoor to Toka.

Serjeant Hanley.

54. Serjeant Hanley was engaged exclusively in preparing the metal for the Poona and Nuggur Road.

Mr. Wainwright.

55. Mr. Wainwright appears to have been principally employed in executing petty works, and works of emergency, both at the Station and in the Districts.

Bhasker Vittul.

56. Bhasker Vittul has been chiefly employed, during the past year, in carrying out Lieutenant Cotgrave's orders regarding the works in progress at this Station; but he was also deputed to superintend repairs of a trifling nature to several works in the Districts.

Agency available and desirable for carrying on Works.

European Agency.

57. With reference to the agency available for the works sanctioned for the present year, I am of opinion that the two Assistants at present attached to this office will suffice, so long as their services are not continually called into

requisition by the Civil Authorities for the investigation of irrigational projects. It is impossible for any Officer, however zealous he may be, to execute satisfactorily several works of an important nature at the same time. If, for example, an Officer is engaged, as Lieutenant Sprot was last year, in the construction of upwards of twenty miles of new road, his attention should be entirely devoted to that work, and on no consideration should he be called upon to undertake anything else. If you concur in this opinion, it will be necessary to provide other assistance expressly for the purpose of investigating such irrigational projects as the Collector may bring forward. One Assistant might be deputed at first for this duty, and another added afterwards if considered necessary.

Native Agency.

58. Regarding subordinate assistance in excess of what is already provided, I have before brought to your notice the necessity for increasing the Establishment; and if three competent Surveyors and Builders, and a similar number of young lads, were added thereto, the works to be executed after the monsoon ought to be proceeded with vigorously.

Works required to be performed.

Malligaum Road.

59. It is a subject for wonder that two Stations, such as Ahmednuggur and Malligaum, should never have been connected by a road of any description, and this want of proper communication would have occasioned the Field Force under Major General Woodburn considerable inconvenience, had it, as at one time contemplated, marched from this place direct to Malligaum; indeed it is very doubtful (and must have entirely depended on the state of the weather) whether the Force could have moved along that portion of the track which, extending for some miles, passes entirely over black soil.

60. I am therefore of opinion that this work is the most important for present consideration; that such an impediment to the passage of Troops on such an important line should be removed; and that the produce of so rich a portion of the Province

should not be partially shut up for want of proper communication.

Branch Lines.

61. Branch lines of road should be selected to meet the Railroad between Poona and Sholapoor, if it is not in contemplation to run a branch line from the Railroad into this Collectorate at an early date; but I can scarcely conceive that the Railway Authorities will defer, for any length of time, the construction of a feeder of so much importance.

Irrigation.

62. Proper attention should be paid to the subject of irrigation in this Collectorate; and if considered worthy of serious attention, and that it would be advisable to carry on investigation on a *large scale*, a separate establishment should be entertained for this purpose, as it is impossible for the Executive Engineer, with the multifarious duties he is called upon to perform, to undertake it also, with any chance of a satisfactory issue.

Aqueducts in and about Nuggur.

63. I would wish very much to draw your attention to the state of the aqueducts in and about the city of Nuggur, which, from continual repairs, and owing in some parts to error in original construction, requires to be periodically cleared, and, at times, occasions the people of the City and of the Native Regiment stationed here great distress. Portions of these aqueducts ought to be entirely renewed, and to be formed of a different and more durable material than that of which they were originally constructed.

64. I have not time to hunt up the correspondence which has taken place on this subject, but I am assured by the Collector that these aqueducts have afforded continual matter for complaint for years, and that the cost of clearing them has amounted to something enormous; moreover, there can be no doubt that the expense must be recurring and increasing so long as the present pipes exist.

65. In conclusion, I hope I may be pardoned if I venture to propose a change in the system of constructing new roads in this Collectorate. At present what is called a moorum road can only be considered in the light of a cleared track when it passes over good soil, and a slightly raised surface road when traversing black soil. I would ask why these roads are made? and whether, in forming them, it is not proposed eventually to make them more perfect? If this supposition be correct, it would certainly be more economical to form a road at first on proper gradients, and to kerb and drain it throughout; and it would be infinitely more satisfactory in the end to the Government and to all concerned in its construction. Look at the Poona and Nuggur Road in this Collectorate,—could such another road be found in any part of India on which an equivalent sum has been expended? Is not its unevenness evident to every person of *feeling* or *observation* passing over it? How unsightly are the chief portion of the masonry works constructed along it! What a multiplicity of designs is observable in these constructions, and some how hideous! And now, in order to convert this into a first class road, it ought to be in a great measure remade, proper gradients ought to be laid down, and, if the shape of the roadway is to be preserved, kerbstones are absolutely necessary; Ghaut roads require to be remade; deviations involving large outlays are necessary. In short, I must express it as my opinion, that every road should be properly surveyed before it is commenced, and then formed on such gradients as will admit of its receiving a metalled surface, when the increasing traffic renders such a measure necessary, without any alteration in its original construction.

Remarks regarding construction of Roads.

I have the honour to be,

Sir,

Your most obedient Servant,

C. Scott, Captain,

Acting Executive Engineer, Ahmednuggur Collectorate.

No. 4139 of 1857.

Public Works Department.

Office of Chief Engineer of Public Works,
Bombay, 7th August 1857.

To the Right Honorable Lord Elphinstone, G.C.H.,
Governor and President in Council.

My Lord,—In compliance with the instructions in para. 5 of the Government Resolution under Mr. Secretary Hart's Memo. No. 1806, of the 27th November 1855, I have the honour to submit a report by Captain Scott, Acting Executive Engineer Ahmednuggur Collectorate, of the operations of the Public Works Department in that Collectorate during the year 1856-57. The report has been forwarded to me by the Acting Superintending Engineer Central Province without remark, I presume from that Officer having but lately joined his appointment and having as yet had no opportunity of making himself acquainted, by personal observation, with the condition of the Public Works in the Ahmednuggur Collectorate.

2. There are some opinions and observations in Captain Scott's report which call more especially for remark; but I propose in the first place to notice briefly the work executed during the past year. The satisfactory completion, for a sum very considerably within the estimate, of a road twenty-two feet wide, much of it through heavy rock-cutting, on a gradient of 1 in 20, with covered cross drains and one skew bridge of four arches of twenty feet, down the Emampoor Ghaut, which is 2 miles 5 furlongs long, and the rapid progress of the road from the foot of that Ghaut to Toka, 26m. 1f. 102y., are the most gratifying features in the report. Captain Scott attributes the expeditious completion of the Ghaut to "the creditable exertion of the Overseer employed in its construction" (para. 7), Serjeant O'Connell apparently (para. 53). Captain Scott's report informs us that there still remain one river and four large streams for which bridges have not yet been provided on this road.

3. In unpleasing contrast with the above favorable report of progress, are the failure of the bridge over the Waghoonda River, and the insufficient waterway of most of the culverts and lesser cross drains on the portion of the Poona and Ahmednuggur Road within the Ahmednuggur Collectorate. The defects in the design and execution of these works are much to be regretted, but as these failures and their probable causes have already been brought especially to the notice of your Lordship in Council in a separate report, I think it unnecessary to go over the ground again. Of the fifty-five culverts sanctioned for this road, twenty-five only have been built; and plans and estimates for remedying the deficiencies of those already constructed, and for building the remaining culverts with enlarged waterways, have been called for.

Letter from the Chief Engineer of Public Works, No. 3855, of the 22nd July 1857.

4. Another most unsatisfactory subject follows under the head of metalling the portion of this road between Ahmednuggur and Poona within the Ahmednuggur Collectorate. Captain Scott states the length of this road to be 39 miles 3 furlongs, but as nine miles of this road are on a faulty line, they were omitted in the estimate, which provided only for metalling the remainder. The deficiency, therefore, has not been quite so great as it appears to be from Captain Scott's report, the part for which metal is still wanting being only about six miles instead of fifteen. The whole of the spreading, however, still remains to be done, and the carting of metal for one half-mile, in addition to the above deficiency; and I have little doubt that Captain Scott is right in attributing the insufficiency of the very liberal estimate for this work to the "want of proper superintendence" (para. 25). A supplementary estimate for completing the metalling of this road was submitted by me on the 8th November 1856, but not sanctioned or approved by your Lordship in Council. Since then, however, your Lordship in Council has been pleased to sanction, under Mr. Secretary Hart's Memo. No. 1829, of the 25th June last, the metalling of two miles of the road, with a view to determine the rate at which the broken stone can be spread; and

Letter from the Chief Engineer of Public Works, No. 9254, of the 8th November 1856.

on the completion of that experiment, I hope to be able to submit a more satisfactory estimate of the cost of spreading the remainder of the collected material.

5. The construction of a moorum road, with paved dips and some culverts, from Elúd to Yeola on the Ahmednuggur and Malligaum line, the improvement of the communication between which two Military stations Captain Scott warmly advocates (paras. 59 and 60) and not without reason, is entered under Item 31 Statement No. 1 of the Budget for this year, and the continuation of the same road to the Girnar Bridge at Malligaum is provided for under Item 40 of the same statement. The work, however, cannot be commenced until the sanction of the Honorable Court of Directors be obtained. In the mean time I venture to submit a question, whether, under present circumstances, the importance of this line as a Military communication considered, it might not be advisable to authorise the immediate improvement of those portions of the line which pass over black soil and after rain are impassable.

6. I do not think it necessary to notice the other projects for roads within the Ahmednuggur Collectorate enumerated by Captain Scott (paras. 37 to 45). Of those which have been included in the Budget this year, there are none but the Ahmednuggur and Malligaum line, it appears to me, which have claims to exemption from the stoppage of Public Works recently directed by the Government of India.

7. The alterations and additions to the Artillery Barracks at Ahmednuggur, sanctioned in 1855, appear to be somewhat more than half finished. Of the four barracks for the married men, about a quarter of the work is done. A harness-room for the Field Batteries, and a necessary for the Camp-followers, have been built (paras. 28 to 31). I have not been satisfied with the rate of progress in these Military buildings; it has appeared to me slow.

8. In paras. 47 to 56 of his report, Captain Scott enumerates the superior and subordinate Officers employed in the Ahmednuggur Collectorate, and states how they were employed; but makes no remarks on their qualifications or conduct, with which, from having so recently joined, he was probably unacquainted. I have already

noticed that Serjeant O'Connell was employed on the Emampoor Ghaut, which Captain Scott thought very creditable to the Overseer. On the other hand he attributes the mismanagement in the preparation of broken stone on the road towards Poona to want of proper superintendence, and I observe that Serjeant Assistant Overseer Hanley was the Overseer employed on that work.

9. In his 57th paragraph Captain Scott deprecates the diversion of the attention of the Assistant Executive Engineers from the roads on which they may be employed by the calls of the Civil Authorities for the investigation of irrigational projects, and thinks that other assistance should be separately provided for the latter (see also para. 62). I doubt whether the importance of irrigational projects in the Ahmednuggur Collectorate would be sufficient to authorise the exclusive employment of an Engineer upon those projects only. The recent prohibition, however, against the prosecution of all Public Works not of urgent necessity, disposes of this question for the present. The same remark applies to Captain Scott's recommendation, in the 58th paragraph, for increased subordinate assistance in the Ahmednuggur Collectorate.

10. In stating that branch lines of road should be opened to meet the Railroad, Captain Scott qualifies his statement by expressing his conviction that the Railway Authorities will not defer for any length of time the construction of a branch Railway into the Ahmednuggur Collectorate (para. 61). I should suppose that Captain Scott is right in his expectation. The importance of a branch or branches of the Railway traversing this part of the country is palpable on inspection of the Map.

11. The suggestions about renewing portions of the aqueducts which supply Ahmednuggur with water (paras. 63 and 64) are worthy of attention; but their consideration must, under existing financial pressure, be postponed.

12. I agree with Captain Scott in the remarks of his concluding paragraph upon roads to the following extent, viz. that every road, even a clearance, should in the first instance, if possible, be laid out on the best line as to direction and gradients, with some regard

however to the towns and villages near which it passes. Nevertheless, to lay down a rigid, immutable rule, as proposed by Captain Scott, that such a line shall forthwith after being laid out be kerbed and drained throughout as the first operation, is not, in my opinion, advisable. The nature of the soil and country and climate, and other varying circumstances, will constantly suggest modifications of whatever rule may be proposed for guidance. The Poona and Ahmednuggur Road is certainly well chosen as an exemplification of the evils arising from a line of road not having been properly laid out in the first instance, but unfortunately there is no want of such examples on this side of India. I agree with Captain Scott that many portions of this road require "to be re-made," that is to say, laid out and made on a new line. Mr. Victor is now, I understand, employed on taking a longitudinal section of the road with the view of determining where such deviations are necessary, and until this point be determined no further expenditure should be sanctioned on the Poona and Ahmednuggur Road beyond ordinary repairs.

I have the honour to be,
My Lord,
Your Lordship's most obedient Servant,

C. Waddington, Major General,
Chief Engineer of Public Works.

CANDEISH.

REPORT ON THE MORE IMPORTANT WORKS CARRIED ON IN THE CANDEISH COLLECTORATE DURING THE YEAR 1856-57.

The principal works that were carried on during the past official year are as follow :—

1. Public Department. Roads and Bridges; New Works.

I. *Bombay-Agra Line of Road; Trunk Line.*

Construction of a bridge over the Girna River near Malligaum.

Construction of road deviation forming approach to the Girna Bridge on the south bank of the river.

Improvement of existing line of road between the Scindwa Ghaut and Punakheira; construction of a new line in deviation from Punakheira to Sawulda on the Taptee River; and improvement of north descent into the Taptee River.

II. *Line from Surat to Dhoolia and Malligaum.*

Construction of a road over the Kondaibaree Ghaut.

III. *Line from Surat viâ Nundoorbar to Northern Candeish.*

Construction of a permanent road from Nundoorbar *viâ* Veesurwarree to Soneghur towards Surat.

2. Revenue General Department.

New Works.

Construction of a new Cutcherry for the Mamlutdar at Amulnair.

3. Revenue Irrigational Department.

Extraordinary Repairs.

1. Repairs to Bundara and Watercourse of Moharee.
2. Ditto ditto of Khutghur.
3. Ditto ditto of Tarrabad.

4.	Repairs to Bundara and Watercourse		of Kirwarra.
5.	Ditto	ditto	of Billadee.
6.	Ditto	ditto	of Wursoos.
7.	Ditto	ditto	of Patoonda.
8.	Ditto	ditto	of Dongruz.
9.	Ditto	ditto	of Wanowlee.
10.	Ditto	ditto	of Brahminwell.
11.	Ditto	ditto	of Dhumnair.
12.	Ditto	ditto	of Tandoolwaree.
13.	Ditto	ditto	of Deobhana.
14.	Ditto	ditto	of Seerusmunee.
15.	Ditto	ditto	of Ootoor.
16.	Ditto	ditto	of Wazdureh.
17.	Ditto	ditto	of Sahowkee.
18.	Ditto	ditto	of Roondmallee.
19.	Ditto	ditto	of Waur.
20.	Ditto	ditto	of Suttana.
21.	Ditto	ditto	of Moonjwarra.
22.	Ditto	ditto	of Bulsana.
23.	Ditto	ditto	of Shadah.
24.	Ditto	ditto	of Wurjhurree.

4. JUDICIAL DEPARTMENT.

New Works.

Construction of a new Court-house for the Moonsiff at Nundoorbar.

5. MILITARY DEPARTMENT.

New Works.

Construction of new Pendalls for the Detachment of Native Infantry at Dhoolia.

6. In the Public General, Public Political, and Ecclesiastical Departments no new works or extraordinary repairs of any importance were carried on during the past official year. The usual ordinary and petty ordinary repairs were, of course, executed in all Departments, as well as a few minor works, not deserving of notice in this report.

7. I proceed to notice individually the works above enumerated :—

Public Department. Roads and Bridges; New Works. I.—Bombay-Agra Line of Road; Trunk Line. 1. *Construction of Bridge over the Girna River near Malligaum.*

A bridge of twenty-six segmental arches, thirty feet span and six feet rise, was completed at the close of the official year, with the exception of a portion of its string course and parapets and the metalling of the roadway. The smaller bridge of eight semi-circular arches of twelve feet span, included in this work, and the heavy connecting embankment, together forming the north approach to the larger bridge, were very nearly completed at the end of the year. A serious accident occurred on the Girna Bridge work in December last year. Two arches of the larger bridge were too hastily turned during my absence in the Districts; one of them over a stone and mud centering which had been too hastily repaired after an unseasonably heavy fall of rain. This last arch fell, after the removal of the centering, and killed the Maistree superintending the bridge work (a most valuable subordinate) and hurt a few work-people. The other arch I found looking unsafe, so I had it removed and rebuilt, as well as the one that had fallen.

Estimated cost.....	Rs.	58,250	0	0			
Do. for injury		821	0	0			
					59,133	0	0
Expenditure in 1854-55		2,059	2	9			
Do. in 1855-56		24,162	4	3			
Do. in 1856-57		23,269	12	5			
					49,491	3	5
Balance..	Rs.				9,641	12	7

8. *Construction of Road Deviation forming Approach to the Girna Bridge on the South Bank of the River.*

This is a length of about one and three-quarter miles of embanked roadway coated with moorum to a constant width of twenty-one feet at top with sides sloping 2 to 1, and including in its length seven small bridges and drains, viz. one bridge (skew) of one arch ten feet span; two bridges of two arches each, six feet span; two bridges of one arch

each, six feet span (one of these being a skew bridge); and two single barrel drains, five feet in diameter. All these masonry works were completed at the end of the official year, with the exception of the coping to their parapets, and the embanked roadway was about half completed.

Estimated cost	Rs. 7,166	0	0
Expenditure in 1856-57	4,035	0	10
Balance	Rs. 3,130	15	2

9. *Improvement of existing Line of Road between the Scindwa Ghaut and Punakheira; construction of a New Line in deviation from Punakheira to Sawulda on the Taptee River; and improvement of North descent into the Taptee River.*

This work was originally commenced in the early part of 1855, and carried on until suspended by the rains in June of that year. By that time two miles of embanked road, extending from Palasnair to the north bank of the Punakheira River, had been completed with bridges and drains, and the foundations of the piers and abutments of the Punakheira River Bridge had been filled in, and a considerable portion of the superstructure of the wing walls had been constructed, as also some preparations made for other works, as detailed in my last annual report. The work would have been resumed in the early part of last year, and again carried on until the rains, but for the orders of Government, on the 11th of January 1856, suspending the works on the line. By the orders of Government (Government Circular No. 573, of the 27th of February last) the works on this portion of the line were resumed in March last, and at the close of the official year, on the 30th of April, the superstructure of the piers and abutments of the Punakheira Bridge had been raised nine feet; the new line of deviation had been ranged out for its whole length between Punakheira and Sawulda, a distance of twenty-one miles; and a section had been taken by levelling for seventeen miles of this length. On the new line (which for fourteen miles of its length passes through uncleared jungle, the remaining seven miles running through open cultivated land in the valley of the Taptee) the

jungle had been partially cleared for the whole length, and wholly so to a width of 130 feet (leaving stumps in the ground) for a length of about seven miles; and three miles in length of the line, running through cultivated land, had been defined by side gutters 120 feet apart. Besides the above, the excavation of the foundations of a large bridge (three arches of forty feet span) across the Arnavuttee River, near Sangwee, had been commenced, as well as those of another bridge of a single arch of twenty-five feet span; and the excavation of two new wells, and the re-excavation of an old one, on the new line, had been taken in hand, and materials had been prepared for several more bridges and drains along the line.

Estimated cost:—

Scindwa Ghaut to Punakheira.	Rs.	26,161	0	0	
Punakheira to Taptee River..		1,42,386	0	0	
					1,68,547 0 0
Expenditure in 1854-55		3,136	9	11	
Do. in 1855-56		7,851	4	3	
Do. in 1856-57		6,894	5	0	
					17,882 3 2
Balance					Rs. 1,50,664 12 10

10. *Line from Surat to Dhoolia and Malligaum. Construction of a Road over the Kondaibaree Ghaut.*

The original condition of this Ghaut was described in the last annual report. The cutting for the new line of Ghaut descent has now been roughly completed for a length of $1\frac{7}{8}$ mile. A section of the whole new descent was taken by levelling, with the result of showing an error in my statement in last year's report that the minimum gradient will be 1 in 25, as, though the line might be reduced to that gradient, it will be better and more economical to leave it as constructed with gradients generally less than 1 in 25 but rising in one or two places to 1 in 21. On this new descent, during the past year, 238 running feet of dry stone retaining wall was completed, and one masonry barrel drain three feet in diameter. Further down the pass a proposed deviation from the existing line was ranged out to a length

of 3,600 feet, a levelled section taken, and the jungle cleared. The works were making good progress, when they were suspended by the Government Circular No. 573, of the 27th February last, after which nothing was done, beyond the taking of precautionary measures to secure the works until they might be permitted to be resumed.

Estimated cost						Rs. 74,620	0 0
Expenditure in 1854-55	Rs.	1,879	10	11			
Do. in 1855-56		4,818	11	6			
Do. in 1856-57		11,670	4	0			
						18,368	10 5
Balance.....						Rs. 56,251	5 7

11. *Line from Surat viâ Nundoorbar to Northern Candeish. Construction of Permanent Roadway from Nundoorbar viâ Veesurwarree to Soneghur towards Surat.*

This line was noticed in the last report as cleared for about four miles from Nundoorbar to the Sewan River, and rather more than one and a half mile of permanent roadway constructed, but without drains, one of which had, however, been commenced: this has been completed, as well as another commenced during the last year, both being of a single arch, five feet span. It was stated that an estimate had been submitted for the completion of the Sewan River Bridge of five arches of thirty feet span; this was sanctioned, and the work proceeded with towards the end of the past year, and the mud and stone centerings for the arches were approaching completion, when the work was suspended, among others, by the Government Circular of the 27th of February last. This suspension is particularly to be regretted as regards this work, as the arches would in all probability have been turned before the monsoon, and the centerings will now be lost, as they were not worth the expense of removing. The Government order, however, left me no option, as I could not say the work must be proceeded with, as in the case of the Girna Bridge and one or two other works.

Sanctioned amount.....	Rs. 10,000	0	0		
Do. for completing Sewan Bridge.	5,607	0	0		
				15,607	0 0
Expenditure in 1854-55	3,161	5	10		
Do. in 1855-56	6,126	9	10		
Do. in 1856-57	732	11	1		
				10,020	10 9
Balance				Rs. 5,586	5 3

12. It was stated in the report for last year that estimates had been submitted for completing the road clearances in Candeish commenced by the Department. These have subsequently been approved, and entered in the Budget, for execution during the current official year. Nothing was done in the matter of these clearances during the past official year.

13. The clearance of the line of the Adjunta-Asseerghur Road was not carried on during the past official year, as there was still no superintendence available. I went over the line myself in December last (as I had never before had an opportunity of doing so) previous to detaching an Assistant to complete the survey and marking out of the line; but the Officer I was about to detach on this duty was required for field service in Persia, and the work was therefore again postponed.

14. *Revenue General Department; New Works. Construction of a new Cutcherry for the Mamlutdar of Amulnair.*

This work was described in the last annual report. At the close of the past official year it was completed, with the exception of fitting shutters to door openings and exterior gate, the single-tiled weather-shade all round the quadrangle, the ventilators on the Dhuba roof, and some other interior minor details.

Estimated cost.....				Rs. 4,719	0 0
Expenditure in 1855-56.....	Rs. 163	11	7		
Do. in 1856-57.....	4,051	5	8		
				4,215	5 3
Balance.....				Rs. 503	10 9

15. Revenue Irrigational Department.

Extraordinary Repairs.

1. Repairs to Bundara and Watercourse of Moharee.

Estimated cost.....	Rs. 11,158	0	0
Expenditure in 1856-57	242	10	8
Balance	Rs. 10,915	5	4

Materials for this work had been collected, when it was suspended by the Government Circular of the 27th February.

2. Repairs to Bundara and Watercourse of Khutghur.

Estimated cost.....	Rs. 6,913	0	0
Expenditure in 1856-57	2,253	8	11
Balance.....	Rs. 4,659	7	1

This work, which included some heavy cuttings in stiff soil, was about one-third completed, when the work was suspended by the Government Circular of the 27th of February last.

3. Repairs to Bundara and Watercourse of Tarrabad.

Estimated cost.....	Rs. 3,200	0	0
Expenditure in 1856-57.....	118	3	3
Balance.....	Rs. 3,081	12	9

Materials had been collected, when the work was suspended by the Government Circular above noticed.

4. Repairs to Bundara and Watercourse of Kirwarra.

Estimated cost.....	Rs. 16,750	0	0
Expenditure in 1856-57	202	1	9
Balance	Rs. 16,547	14	3

Materials had been collected, when the work was suspended by the Government Circular above noticed.

5. Repairs to Bundara and Watercourse of Billadee.

Estimated cost	Rs. 2,900	0 0
Expenditure in 1856-57	1,053	15 2
Balance	Rs. 1,846	0 10

It was considered advisable, in order to obtain security from the river floods, to continue the repairs and improvement to the Bundara and adjuncts of this work after the receipt of the Government Circular of the 27th of February suspending all works of irrigation. At the close of the official year the work was about one-third completed.

6. Repairs to Bundara and Watercourse of Wursoos.

Estimated cost	Rs. 3,750	0	0		
Do. for injury	893	2	7		
				4,643	2 7
Expenditure in 1855-56	586	2	2		
Do. in 1856-57	3,658	13	4		
				4,244	15 6
Saving				Rs. 398	3 1

The work was completed in February 1857, including the repairs of the injury caused by a flood in June 1856, as noticed in the last annual report.

7. Repairs to Bundara and Watercourse of Patoonda.

Estimated cost				Rs. 3,400	0 0
Expenditure in 1855-56	2,766	12	7		
Do. in 1856-57	394	5	4		
				3,161	1 11
Saving				Rs. 238	14 1

Completed in December last.

8. Repairs to Bundara and Watercourse of Dongruz.

Estimated cost				Rs. 1,400	0 0
Expenditure in 1855-56	1,338	8	6		
Do. in 1856-57	61	1	11		
				1,399	10 5
Saving				Rs. 0	5 7

Completed in July 1856.

9. Repairs to Bundara and Watercourse of Wanowlee.

Estimated cost				Rs. 2,000	0 0
Expenditure in 1855-56	1,260	6	5		
Do. in 1856-57	470	12	4		
				1,731	2 9
Balance				Rs. 268	13 3

The circumstances which led to the suspension of the works of this Bundara were noticed in the last annual report. A suplementary estimate for the completion of the works has been submitted. About three-eighths of the whole of the works required may be said to have been completed.

10. Repairs to Bundara and Watercourse of Brahminwell.

Estimated cost				Rs. 5,000	0 0
Expenditure in 1855-56	2,033	15	9		
Do. in 1856-57	2,964	3	3		
				4,998	3 0
Saving				Rs. 1	13 0

The works of the three Bundaras and watercourses, called Bhowargud, Rungmulla, and Dhunnaiban, were all completed in November 1856.

11. Repairs to Bundara and Watercourse of Dhumnair.

Estimated cost				Rs. 2,200	0 0
Expenditure in 1855-56	124	13	7		
Do. in 1856-57	2,019	1	2		
				2,143	14 9
Saving				Rs. 56	1 3

Completed in November 1856.

12. Repairs to Bundara and Watercourse of Tandoolwaree.

Estimated cost				Rs. 8,507	0 0
Expenditure in 1855-56	1,254	1	0		
Do. in 1856-57	5,768	8	10		
				7,022	9 10
Balance				Rs. 1,484	6 2

The work was about four-fifths completed, when it was suspended in consequence of the Government Circular of the 27th of February last.

It would have been completed in all probability before the monsoon of the present year.

13. A new Bundara and repairs to the Watercourse of Deobhana.

Estimated cost				Rs. 1,650	0 0
Expenditure in 1856-57				1,729	2 7
Excess				Rs. 79	2 7

Very nearly completed at the close of the official year. Some additional works are still, it is reported, required. A supplementary estimate will be submitted shortly for the completion of the work.

14. Repairs to the Bundara of Seerusmunee.

Estimated cost.....				Rs. 250	0 0
Expenditure in 1855-56 ..	208	6	2		
Do. in 1856-57 ..	34	0	6		
				242	6 8
Balance.....				Rs. 7	9 4

A small work, of embanking the right flank wall of the Bundara. Completed early in the past official year.

15. Repairs to the Bundara and Watercourse of Ootoor.

Estimated cost.....				Rs. 5,000	0 0
Expenditure for 1854-55 ..	1,356	6	4		
Do. for 1855-56 ..	1,597	5	1		
Do. for 1856-57 ..	1,613	7	1		
				4,567	2 6
Saving				Rs. 432	13 4

Completed in November 1856.

16. Repairs to Bundara and Watercourse of Wazdureh.

Estimated cost	Rs. 1,800	0	0		
Do. for injury....	664	9	0		
				2,464	9 0
Expenditure in 1855-56.	361	3	3		
Do. in 1856-57.	1,891	14	9		
				2,253	2 0
Saving				Rs. 211	7 0

Completed in April 1857, including the repairs of the injury caused by a flood in June 1856, as noticed in the last annual report.

17. Repairs to Bundara and Watercourse of Sahowkee.

Estimated cost				Rs.	2,850	0 0
Expenditure in 1854-55	268	14	5			
Do. in 1855-56	702	4	11			
Do. in 1856-57	346	10	9			
					1,317	14 1
Saving				Rs.	1,532	1 11

Completed in July 1856, as stated, and the large saving explained, in the last annual report.

18. Repairs to Bundara and Watercourse of Roondmallee.

Estimated cost	3,450	0	0			
Do. for injury	1,049	11	3			
					4,499	11 3
Expenditure in 1855-56	1,432	3	0			
Do. in 1856-57	2,737	12	4			
					4,169	15 4
Saving				Rs.	329	11 11

Completed in April 1857, including the repairs of the injury caused by a flood in June 1856, as noticed in the last annual report.

19. Repairs to Bundara and Watercourse of Waur.

Estimated cost				Rs.	7,399	0 0
Expenditure in 1855-56	5,442	8	3			
Do. in 1856-57	1,924	8	11			
					7,367	1 2
Saving				Rs.	31	14 10

Completed in July 1856.

20. Repairs to Suttana Watercourse.

Estimated cost	Rs.	1,117	0 0
Expenditure in 1856-57		876	15 11
Balance	Rs.	240	0 1

The work was about three-fourths completed at the end of the official year.

21. Repairs to Moonjwarra Watercourse.

Estimated cost	Rs. 400	0	0
Expenditure in 1856-57	399	10	3
Saving	Rs. 0	5	9

Completed in June 1856.

22. Repairs to Bundara and Watercourse of Bulsana.

Estimated cost	Rs. 806	0	0
Expenditure in 1856-57	724	1	0
Saving	Rs. 81	15	0

The Bulsana Bundara and Watercourse had lately been rendered efficient, and the works completed, when a flood in June 1856 did some injury, for the repair of which these works were required, and they were completed in April 1857.

23. Repairs to Bundara and Watercourse of Shadah.

Estimated cost	Rs. 617	0	0
Expenditure in 1856-57	615	5	0
Saving	Rs. 1	11	0

A similar case to the above. The repairs were completed in February last.

24. New Bundara at Wurjhurree and repairs to Watercourse.

Estimated cost	Rs. 988	0	0
Expenditure in 1856-57	27	14	8
Balance	Rs. 960	1	4

The work of collecting materials for this Bundara had shortly been commenced, when the work was suspended by the Government Resolution of the 27th of February last. I have no further remarks to make on any of the abovementioned irrigational works, as their nature is in every respect the same as described in my last year's report.

16. I have not heard of any instances of failures during the past year in any works constructed by the Department, though in one or two cases (the Chicksee Bundara for instance, noticed in last year's report) the supply of water in the river behind the dam has failed very early in the dry season; but I am informed that the past monsoon, though more than ordinarily heavy, and good for the crops, was not so favorable in the matter of feeding the springs in the beds of the rivers in the Western Talookas where the Bundara system prevails, as a lighter monsoon ending later in the year, and consequently extending its influence further into the succeeding dry season.

17. *Judicial Department. New Works. Construction of a new Court-house for the Moonsiff at Nundoorbar.*

Estimated cost	Rs. 2,120	0	0
Expenditure in 1856-57	111	5	11
Balance	Rs. 2,000	10	1

Some materials had been collected for this work, and I was on my way to Nundoorbar to settle a long-pending question regarding its site, when the Government Circular of the 27th of February last put a stop to the work, and made a change in the direction of my movements.

18. *Military Department. New Works. Construction of new Pendalls for the Detachment of Native Infantry at Dhoolia.*

Estimated cost	Rs. 28,557	0	0
Expenditure in 1856-57	362	4	5
Balance	Rs. 28,194	11	7

This work was commenced within a short time of the close of the official year, and about one-half of the work of excavation for foundations for the whole of the buildings had been completed. Stone had also been collected for filling-in the foundations. An estimate is about to be submitted for an interior longitudinal and two transverse partition walls, carrying accoutrement pegs.

19. The Superintending Engineer has expressed a wish that the

results of the destruction of the queen white ants, in eradicating the nests of these destructive creatures, should be noticed in this report. It can only be said that the system of digging up nests, whenever they appear in the vicinity of public buildings, and destroying the queens, appears to provide the only method by which the ravages of these insects can be guarded against and kept under as much as may be. Sufficient time has not elapsed since this eradication was authorised to be continually carried on, to enable us to judge whether the numbers of nests have materially diminished; but, to check any too sanguine expectation of the entire success of the system, it is only necessary to remember the fact, that of the many thousands that take flight at the setting in of each monsoon, every pair that may escape destruction during flight will establish a new colony.

20. I have to remark, with reference to the execution of public works by the Department in Candeish, that as public works have of late years increased on our hands in number and importance, our great want has been, and is, a proper supply of Biggaries. In Candeish itself, except in rare seasons of famine, no labourers are to be obtained, the whole available population being engaged in the cultivation of the soil; all our best labourers are imported from the Deccan, and every endeavour is made to retain them in our service by throwing them into parties, and providing them with constant work throughout the year, but they frequently desert to return to their own country, where they are now sure of finding employment on the Railway works in progress, and sometimes to obtain employment on works being carried on in the Province under the Collector or others; these desertions being generally to avoid payment of advances made to them by their Muccadums when engaged for service. In some localities the services of a few Bheels, more or less, can be obtained; but, as a general rule, they are comparatively of little use except for mere jungle clearances, and, even in that work, they come and go, work or idle, as they choose, and will rarely attend to orders, unless these fall in with their own inclinations. Just at this season of the year, when their grain carriage is necessarily suspended, parties of Wunjarras are willing to take service as

Biggaries, and work very well; but we are not generally (though we are this year) in particular want of additional hands during the monsoon, as our working parties, driven in from the Northern and Western Districts by the rains, are usually found sufficient for such works as can be carried on during the rainy season.

Superintending Establishment; Executive Engineer and his Assistants.

21. I have again to record many changes in the superior Officers of the Department during the past official year.

At the commencement of the official year I had with me the Assistants noticed in my last report, viz:—

Captain Lockhart, of H. M.'s 78th Highlanders, and
Captain Piers, of the 29th Regiment N. I.

Captain Lockhart was employed in completing some detailed surveys required of the Chandul Baree, a small Ghaut on the line of the Malligaum-Ahmednuggur road, and in some levelling operations connected with irrigational works in the Western Districts. Later in the year he took by levelling a longitudinal section of the whole line of the Lulling Ghaut, between Malligaum and Dhoolia; but having been attacked by fever at the close of this duty, he was obliged to proceed on sick leave to Nassick, for a few weeks, in November last. On his return he roughly plotted his Lulling Ghaut section, shortly after completing which, he was, in January last, ordered to join his Regiment proceeding to Persia, and has not since joined the Department.

22. Captain Piers continued in charge of the Dhoolia Office until November last, when he obtained permission to exchange appointments with Captain Beale, of the 22nd Regiment N. I., and quitted Candeish, having carried on the current duties of the Station of Dhoolia and superintended such repairs as might be called for. On his departure I absorbed the Dhoolia Office into my own. It will be understood that neither to Captain Piers nor Captain Lockhart did I entrust the execution of any work of construction involving anything beyond a trifling amount of professional knowledge (with the exception of the completion, under Captain Piers, of

the works left nearly finished by Mr. West) as I preferred taking all into my own charge at whatever inconvenience; nor did I receive much assistance from these gentlemen in the matter of projects and designs; indeed, I did not expect anything of the kind. I can only add that what was done by them both was done to the utmost of their ability, and with an evident desire to make themselves useful.

23. Captain Beale, of the 22nd Regiment N. I., joined my Department in December last, and was to have proceeded immediately to complete the survey, &c. of the Adjunta-Asseerghur Road (see para. 13 above), but was at first detained in Malligaum, as he informed me, by some pressing Regimental business, and, when about to proceed to the Eastern Districts early in January, was suddenly required to join the Company of his Regiment proceeding to Persia. Captain Beale has, within the last few days, rejoined the Department, and it remains to be seen what use I shall be able to make of his services: my late experience, however, of unprofessionally qualified Officers sent to me as Assistants, leads me, at present, to say that I had rather not have such Assistants at all; as, while their pay, &c. is a heavy charge on my establishment, the value to me of their services has not hitherto been equal to that of the services of the young Sub-Assistant Surveyors of the Department.

24. Lieutenant Maunsell, of the Engineer Corps, joined me late in December last, and was almost immediately placed temporarily in charge of the Department, in consequence of my absence for a month in Bombay, in January and February last. On my return to Candeish he proceeded with some levelling operations connected with irrigational works in the Districts, and subsequently joined me with the view of making himself acquainted, while in my company, with the nature of the different works connected with improvements and repairs to irrigational works in the Province, in order to be able as soon as possible to prepare designs for numerous works called for by the Collector. On the receipt by me of the Government Circular of the 27th of February last, Lieutenant Maunsell, who had only just joined me, accompanied me to the north of the Taptee, where he has been employed ever since, having levelled the greater portion of the line

between Punakheira and the Taptee River, and plotted the sections, as well as assisted me in the preparation of designs for bridges and drains on the line, in lining out the same for execution, and in superintending their construction. I need only add, that I much regret that circumstances did not admit of my obtaining the services of Lieutenant Maunsell, or some other similarly qualified Officer, when Mr. West was taken from me in December 1855.

Surveyors and Builders.

25. During the past official year the three Surveyors and Builders of the old class, who have for many years past been connected with the Department in Candeish, viz. Narrayen Wittul (No. 46), Dajee Abajee (No. 69), and Luxumon Ramchunder (No. 71), have been employed, as in previous years, in the superintendence of the works in progress (principally those connected with irrigation) and in preparing surveys and sections, and subsequently plans and estimates, for projected works. Narrayen Wittul has also, during the past year, carried on very satisfactorily the Kondaibaree Ghaut work.

Damodhur Mayaram and Fackeerjee Pestonjee, the Sub-Assistant Surveyors noticed in my last annual report, have continued to give entire satisfaction. Fackeerjee has continued attached to the Surveyor Luxumon Ramchunder, and may be considered qualified for the independent charge of works in progress and the design of projects. Damodhur has lately been required at the Head-quarters Office for translating and correcting estimates, &c., and has consequently lost many advantages in the matter of acquiring practical knowledge of building, &c.; but I believe he will be found deserving of speedy promotion after joining his appointment in Kurrachee, to which office he has, within the last few days, been transferred.

Three more Sub-Assistant Surveyors, viz. Framjee Merwanjee, Nusserwanjee Jamsetjee, and Purshram Muckoondjee, joined my Department in July last year, having been attached, I was informed, to my Office with the view of their becoming acquainted with the principles of the system of irrigation by Bundaras in the Province. After being

usefully employed, until December last, in plan-drawing and estimating, in my Office, they were attached, early in the present year, to the senior Surveyors, Narrayen Wittul and Luxumon Ramchunder, and would this season have had every opportunity afforded them of making themselves acquainted with the nature of the different works of irrigation, but the moving of the whole working establishment to the north of the Taptee for the superintendence of the new road works, has necessarily prevented this. On the receipt of Government Circular of the 27th February, the whole of the Surveyors and Sub-Assistant Surveyors accompanied me to the north of the Taptee; and the road line, after being ranged out and the levels taken by Lieutenant Maunsell and myself, has been divided between the three senior Surveyors, who, with their Sub-Assistants, have been employed in clearing and constructing the line and taking cross sections.

Maistries.

27. Under this head, and with reference to my remarks under the same head in my last annual report, it is with deep regret I have to notice the decease of the elder of the two brothers so highly commended by me. Succaram Gunput was killed by the fall of an arch of the Girna Bridge, as explained in para. 7 above, and great is the loss to the Department of his valuable services. Most fortunately his brother, Bappoo Gunput, was, at the time of his death, available for superintending the carrying on of the Girna Bridge work, having completed the Punjur River Bridge, and not having at the time any very important work on his hands. By him this bridge work also has now been nearly completed, and I would beg leave respectfully to draw attention to the recommendation made in my last year's report that this deserving man should be promoted to the grade of a Sub-Assistant Surveyor, on a salary of Rupees sixty (60) per month, and regarded as one of the old class, not required to compete for promotion with smart young men from the Colleges, but promoted at regular intervals of five years, according to qualifications and conduct. I would urge this the more earnestly, as his brother, who would, I hoped, have been joined with him in promotion to the desired grade, is

SKETCH MAP
of
CANDEISH.

Scale 8 Miles to an Inch.

Sendwa Ghaut
Sultanpoor
Shuda 23
Tulloda
Kevkurmoonda
Sirpul
Surungkeera
Sangwee
Pulasnair
Panakeera
Asseerghur
Kurwund
Dhyrwud
Serpoor
Boorhanpoor
Billadie
Nundoorbar
Dhondaicha
Runnalla
Sawalda
Palazee
Sindkeera
Wurjhurree 24
Chopra
Arrawud
Yaoul
Sackly
Borhaeyul
Edulabad
Berar
Chimlana
Nildana
Bulsana 22
Woodiree 16
Brahminwel 10
Wurzee 6
Roondmullee 18
Zeytana
Yesurwarree
Khodalbarree Ghaut
Seneghur
Nowapoor
Songier
Dhunnair 11
Dheyvedi
Deobhana 13
Moharee 1
Amulneer
Dhurungaum
Pahdee
Julgaum
Nusseerabad
Kirvara 4
Goredah
Saakry
Errundole
Cuckee
Cmalla
Bodwar
Musaeved
Nairee
Dummeer
Wakary
Fulfeir
Jamlee
Kassara
Nile
Wuur 19
Dhoolia
Musvah
Parola
Pimpulneer
Hiae
Tackry
Tullagaum
Tandoolwaree 12
Arree
Mhur
Borkoond
Bhurgaum
Sindeernee
Tarabud 8
Khedgahur 2
Moolair
Naumpoor
Therga
Wurgaum
Fierdapoor
Chandoor
Dongrug 8
Wanolee 9
Chickulwal
Adgunta
Malligaum
Moonjwara 21
Sultawa 20
Patoonda 7
Sahowky 17
Lonere
Challesgaum
Kulwun
Soundana
Tamdurga
Abonah
Julgaum
Dowlatta Ghaut
Sarusmand 14
Cetoor 15
Nandgaum
Kunkur
H. Chandore
Manmaur
Dang Forests
Province of Berar

REFERENCES.

Roads made-meerum, constructed by the Engineer Department
Dº Dº, under construction by Dº
Dº Dº, proposed
Dº Fair-weather, cleared by the Engineer Department
Dº Dº, proposed
Dº Dº, cleared by the Collector
Dº Dº, proposed
Dº Dº, cleared by the Bheel Agent at Kunkur
Line of Railway proposed to pass through Candeish
Railway Stations — Musaeved
Proposed lines of Branch Roads to Railway Stations
Irrigational Works, carried on during 1866/67 — Deobhana 13

(Signed) H.W.B. Bell, Captain,
Executive Engineer Candeish Collectorate

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B.B.S. Press

now no more, and upon the younger brother falls, I believe, the entire support of the widow and family of the deceased.

28. I have only, in conclusion, to sum up the contents of this report. The different works carried on in the Department during the past official year have been enumerated and briefly described; an explanation has been suggested of the failure, early in the dry season, of the springs in the beds of some of the rivers or nullahs in Western Candeish; the results, as far as can at present be ascertained, of the destruction of white ant queens have been stated; and the deficiencies in the number of working Biggaries to meet the wants of the Department of late years has been noticed and explained. As regards the superintending establishment, the changes in the Department have been enumerated; the duties on which both superior and inferior subordinate Officers have been employed have been detailed; and an opinion has been expressed, grounded on late experience, as to the comparatively little value of the services, as Assistant Executive Engineer, of Officers unprofessionally qualified. In the last place, the death of a valuable subordinate has been noticed, and, with reference to the report of last year, the promotion of his brother to a higher grade than that of Maistree has again been urged. The report, therefore, cannot be said to contain any matter of general interest; but, such as it is, is submitted as desired.

H. W. B. Bell, Captain,
Executive Engineer Candeish Collectorate.

No. 3887 of 1857.

Public Works Department.

Superintending Engineer's Office, Central Province,
Poona, 1st July 1857.

Transmitted to the Chief Engineer of Public Works, with reference to Lieutenant Southey's Memorandum No. 12731, of the 19th December 1855.

2. A Sketch Map of Candeish is annexed to this Report, in order to illustrate the relative positions of the different works carried on during the past year.

C. W. TREMENHEERE, Major,
Acting Superintending Engineer, Central Province.

No. 4083 OF 1857.

PUBLIC WORKS DEPARTMENT.

Office of Chief Engineer of Public Works, Bombay, 3rd August 1857.

I submit the foregoing for the information of His Lordship in Council, with reference to para. 5 of the Government Resolution under Mr. Secretary Hart's Memo. No. 1806, of the 27th November 1855. Captain Bell's report is very clearly drawn up, indeed faultless in its lucid arrangement. He states some of the difficulties which have retarded the prosecution of works in Candeish during the past year. This explanation is well timed, for I have been disposed to find fault with the slow progress of his works. Captain Bell explains that there is a scarcity of labourers in Candeish, and that they require to be imported from the Deccan. He also shows that from various causes his Assistants have not been very effective during the year. Captain Bell's opinion respecting the value of unprofessionally qualified Assistants, expressed in the latter part of his 23rd paragraph, very accurately represents my own. It has always been a subject of regret to me that the exigencies of the Service seemed to require for a time the admission of unqualified, or very partially qualified Officers to the Department, but I trust that the exigency will not again occur.

Memorandum by the Acting Superintending Engineer Central Province, No. 3887, of the 1st July 1857, preceded by a Report by Captain Bell, on the more important works carried on in the Candeish Collectorate during the year 1856-57, with a Sketch Map of Candeish.

2. The first work noticed in Captain Bell's report is the large

bridge over the Girna River, of twenty-six arches of thirty feet span, which is now approaching completion, together with its expensive approaches. On the north side there is a very heavy embankment, and a bridge of eight arches of twelve feet span. On the south, a deviation from the main road became necessary to meet the bridge, and was separately estimated. It forms an embanked road, one and three-quarter miles long and twenty-one feet wide, with seven culverts. The culverts are very nearly completed, the embankment about half finished. One arch of the Girna Bridge fell in on removal of the centering, killing the Maistree Bricklayer; another arch was taken down as unsafe. Both arches have been since rebuilt. This accident was reported to Government in my letter No. 528, of the 29th January 1857.

3. Another considerable work on the Agra Road has been the commencement of a new line from Sawulda on the Taptee to Punakheira, twenty-one miles. Of this distance, fourteen miles passing through jungle have been partially cleared throughout, and half of the fourteen miles to the full width of 130 feet (stumps remaining in the ground). Three miles of the seven which run through cultivated land, have been defined by side trenches 120 feet apart. A section of seventeen miles of the whole had been taken by levelling, up to 30th April. Excavations were begun for a bridge over the Arnavuttee River, three arches of forty feet, and another bridge, one arch of twenty-five feet. The piers and abutments of the Punakheira Bridge, three arches of thirty feet, had been raised to nine feet in height.

4. The Kondaibaree Ghaut, between Dhoolia and Surat, is still in a very unfinished state. It has been in progress during three years, and it appears that about one-quarter of the work is done. The cutting for the new line of descent has been roughly made for $1\frac{7}{8}$ mile, and a section taken by levelling shows, that while the gradient is generally less than 1 in 25, it rises in one or two places to 1 in 21. Two hundred and thirty-eight feet of retaining dry stone wall, and a drain, have been built. Further down the pass, a proposed deviation of 1,200 yards was marked out and a section taken. On receipt of

the Government letter of 27th February, No. 573, the work was stopped. On the line from Nundoorbar to Surat a bridge of five arches of thirty feet over the Sehwan River was in progress. During last year the centerings for the arches were approaching completion, but were abandoned by Captain Bell on his receiving the order above referred to. I agree with Captain Bell that this suspension was to be regretted, but he adds that the Government order left him no option.

5. A new Cutcherry for the Mamlutdar of Amulnair has been nearly completed during 1856-57.

6. Of irrigational works in Candeish, which are all of one description, viz. the restoration and improvement of Bundaras and water-courses, twenty-four have been in progress during the past official year. Of these, two were commenced in 1854-55, eleven in 1855-56, and the same number in 1856-57. Fourteen were completed last year, seven were stopped under the operation of the Government letter No. 573, of 27th February, and three of these works Captain Bell thought it expedient to continue. Captain Bell notices that in one or two instances there was a failure of water in the rivers at an early period this last year, notwithstanding a plentiful monsoon. This he attributes to the fall of rain, though heavy, having occurred early in the season.

7. The construction of a Court-house for the Moonsiff at Nundoorbar was set aside in consequence of the Government letter No. 573 (para. 17). Pendals for a detachment of Native Infantry at Dhoolia were just commenced at the close of the official year (para. 18).

8. Lieutenant Maunsell appears from para. 24 of Captain Bell's report to have given him most efficient assistance, and Captain Bell expresses much regret that he did not obtain the services of Lieutenant Maunsell, or some other similarly qualified officer, when Mr. West was taken from him in December 1855.

9. Captain Bell appears to have been satisfied with his three Surveyors and his five Sub-Assistant Surveyors. He writes of Damodhur Mayaram and Fackeerjee Pestonjee, Sub-Assistant Surveyors, that they "have continued to give entire satisfaction," and that the latter

"may be considered qualified for the independent charge of works in progress, and the design of projects."

10. With reference to Captain Bell's recommendation of the appointment of Maistree Bappoo Gunput to the permanent Public Works Department in his 27th paragraph, I beg to suggest, under the very favorable report made of the Maistree's usefulness, that he be appointed a Sub-Overseer of the 1st Class, on a salary of Rupees forty (40) per mensem, according to the classification of subordinates adopted in the Notification by the Government of India No. 117, of the 17th June 1856.

C. WADDINGTON, Major General,
Chief Engineer of Public Works.

SURAT AND BROACH.

CONCISE REPORT OF THE PROCEEDINGS OF THE DEPARTMENT OF PUBLIC WORKS, SURAT AND BROACH COLLECTORATES, FOR THE YEAR 1856-57.

Roads and Bridges.

Commencing from the Southward, the first work met with, which has been under consideration, is the proposed road from Bulsar to Peint. In April and May 1856 a detailed survey was made of the portion of this road which lies in British territory, a length of 21 miles. The estimates were prepared and submitted in September 1856, and amounted in the aggregate to Rs. 1,12,370. Government, in their Resolution No. 2544, of the 23rd December 1856, ordered that provision should be made for the work in the Budget for 1856-57, but in consequence of a representation made by the Chief Engineer of Public Works regarding the advisability of making further surveys, this Resolution was rescinded, and Government determined upon postponing the construction of the road, pending a report upon the possibility of taking it through Dhurrumpore instead of through Balda Pardee as proposed. From some further correspondence that has lately passed between the Chief Engineer of Public Works and this Office, there is hope that the construction of this work will be undertaken in 1857-58, unless again retarded by opposition from the Raja of Dhurrumpore, through whose State it principally passes.

2. Between Bulsar and Surat no projects of roads have been brought forward. The construction of a Railway between Surat and Bombay, which has been so long under discussion, influences so much any projects for roads in the Districts it will traverse, that it would be vain to bring forward, with a chance of success, any scheme for roads, until the exact route of the Railway is settled.

3. The roads about Surat have received considerable attention. They are four in number. The Domus Road, a metalled work, nine

miles in length, and leading from Surat to the seashore; the Kentish Road, likewise a metalled work, one and three-quarter mile in length, and connecting the Domus Road to the Jaffer Alli's Gate of the City; the Kuttargaum Road, made of brickdust and sand, two and a quarter miles in length, and extending from Surat up to the village of Phoolpara and the Railway-crossing over the Taptee; and last, the Veriaw Road, three miles in length, leading from Surat to the ferry over the Taptee on the Broach Road. On the first of these lines, the Domus Road repairs have been executed to a great extent; the embankment across the salt marsh has been strengthened, provided with fresh side-slopes, and the roadway on it been almost renewed; many of the drains have been rebuilt and most of them have had fresh planking inserted in their wooden superstructure. The Kuttargaum Road was extensively repaired with brickdust and sand, but the traffic over it, occasioned by the Railway works at Amrolee, has been so great, that its present condition is almost worse than before. The Veriaw Road has been left for so many years without repair, that it can hardly now be termed a made road. A sum of Rs. 5,780 has been sanctioned for its reconstruction, and the work is now being actively prosecuted.

4. On the north bank, opposite the Surat Castle, the construction of a masonry Hard projecting into the river, and of a road leading from it to the town of Randier, has been sanctioned. This road and Hard will prove of much service to the vast number of people daily passing between the cities of Surat and Randier. The length of the road will be one and a half mile; and the total estimated cost of the work is Rs. 10,412.

5. The continuation of this road from Randier on *viâ* Elao to Hansote, and from thence through Unklesur to Broach, has been under discussion, and the survey is now in progress.

6. From Broach on *viâ* Ahmode and Jumbooseer to the banks of the Myhee on the road to Kaira, and from Jumbooseer to Tunkaria Bunder, surveys are also in course of being made, with a view to the preparation of detailed estimates for roads.

7. A bridge over the Dhadhur River on the first of these two lines, between Jumbooseer and Ahmode, has been estimated for, and the

probable cost, Rs. 44,249, has been included in the Budget of the present year, 1857-58. The Dhadhur River at the point of crossing is a tidal stream, and presents so great an impediment to traffic, that the Cotton trade of Ahmode and the neighbouring District, instead of finding its way to its natural outlet, Tunkaria Bunder, is forced round to the far worse and far more distant port of Broach. The construction of the bridge will be the means, in a great measure, of remedying this evil, and will prove a great benefit and convenience to the trading community of the Jumbooseer Districts. It will likewise afford a passage to the runners on the direct dawk line between Broach and Kaira.

8. On the western shore of the Gulf of Cambay the number of road projects has been fewer, but the work executed has been far greater. The Gogo and Ahmedabad Road has been far advanced this season, and would have been still further, but that the works between Vertez and Dhundooka have been suspended, partly in consequence of the sanction being exhausted, and partly in consequence of a doubt having arisen as to whether a Railway would not be more suitable than a road on the line between Gogo and Ahmedabad. All the bridges between Gogo and Vertez, eleven in number, have been taken in hand, and one of them has been completed. A very large quantity of earthwork has been executed beyond Vertez, and upwards of 120 drains have been constructed. The total amount expended on this road has been Rs. 84,159-14-10.

9. Plans and estimates have been submitted for completing the embankment and drains between Vertez and Dhundooka. Designs and estimates, both fresh and modified, have been forwarded for every bridge required between Gogo and Dhundooka, and estimates have been prepared for metalling the road, as well as for making an alteration in it in the approach to and passage through Gogo. These estimates have, it is believed, been all approved by the Chief Engineer of Public Works, but nothing has been sanctioned beyond the completion of the embankment between Vertez and Dhundooka, and the metalling and bridging of the road between Gogo and Vertez.

10. The Guzerat Ports Committee, in January 1857, recommended,

at a probable cost of Rs. 5,000, the construction of an embankment over the marshes between Dhollera and its principal port, Khoon Bunder, a distance of about five miles. The work was sanctioned, and is now in progress. It will prove a great convenience.

11. The total expenditure has been as follows, viz:—

Description of Works.	Estimated Total Cost.			Expended during the Year.			Total Expenditure.		
	Rs.	*a.*	*p.*	*Rs.*	*a.*	*p.*	*Rs.*	*a.*	*p.*
Making special Repairs to the Made Road from Surat to Domus, a distance of about 9 miles	1,611	0	0	980	6	6	980	6	6
Making special Repairs to the Foot Bridge over the Kharree at Bhaidwar in the Chowrasee Purgunna of the Surat Zillah	581	0	0	464	7	4	464	7	4
Constructing a Foot Bridge over a Kharree between Rayan and Bardollee in the Surat Collectorate	258	0	0	296	6	1	296	6	1
Repairing eleven Bridges across the Ditch round the Fortification of Surat	1,241	0	0	974	2	5	974	2	5
Constructing a Road from Randier to the Ferry opposite the Surat Castle, together with a Masonry Hard at the latter place	10,412	0	0	225	4	0	225	4	0
Making experimental Road between Surat and Koomaria	600	0	0	606	2	3	606	2	3
Constructing a Bridge over a Kharree at Buddulpore	1,402	0	0	54	4	4	1,391	8	8
Throwing a Bridge over the Nullahs between Seedhur and Vertez on the new road from Gogo to Ahmedabad	3,239	0	0	806	5	11	806	5	11
Erecting a Bridge over the large River immediately beyond Budhail on the new road between Gogo and Ahmedabad	11,233	0	0	3,854	9	7	3,854	9	7
Constructing an Embankment with Barrel Drains between Dhollera and Khoon Bunder	5,000	0	0	528	7	1	528	7	1
Making a portion of the New Road to Ahmedabad lying between Gogo and Dhundooka	1,39,225	0	0	74,525	11	6	1,30,148	8	7
Erecting Bridges over the Nullahs on the Gogo and Ahmedabad Road. (Item 12 of the Budget for 1856-57.)	26,794	0	0	4,973	3	10	4,973	3	10
Total.... Rs.	2,01,596	0	0	88,289	6	10	1,45,249	8	3

12. The results of the year's administration contrast favorably with that of preceding years, the expenditure having been as follows, viz:—

	1850-51.			1851-52.			1852-53.			1853-54.			1854-55.			1855-56.			1856-57.		
	Rs.	*a.*	*p.*	*Rs.*	*a.*	*p.*	*Rs.*	*a.*	*p.*	*Rs.*	*a.*	*p.*	*Rs.*	*a.*	*p.*	*Rs.*	*a.*	*p.*	*Rs.*	*a.*	*p.*
Expenditure on Roads and Bridges ...	4,898	4	4	7,050	9	1	1,189	5	6	306	9	0	23,012	15	6	36,546	3	2	88,289	6	10

Thus showing an increase over last year of 141 per cent. and over the other years of more than 283 per cent. Still, however, the work done can hardly be termed satisfactory. The estimates submitted, though far in excess of former years, and though approved of in every instance, have yet not been sanctioned, from causes foreign to themselves, and originating after the orders for their preparation had been issued and after the necessity of the works for which they were intended had been recognised.

Docks, Dockyard Offices, and Buildings for Marine purposes.

13. No portion of the Indian Navy being stationed in this Division, nor any of the ports being resorted to by other than country craft, no works under this head have been executed or are likely to be executed in this Division.

Piers and Jetties, and Clearances of Tidal Rivers.

14. The ports of Guzerat, possessing a trade of at least five millions sterling, are all comprised within the limits of this charge. Wharves, Jetties, and River-clearance ought therefore to form a considerable portion of the duties of the Executive Engineer. Unfortunately, however, such has not yet been the case. The recommendations of the Guzerat Ports Committee may perhaps tend to an alteration in this point. They have proposed and have obtained sanction to the extension of the Chaput Bunder at Surat for a further length of 256 feet; they are preparing designs for a Steamer Wharf at Surat, for two Jetties at Randier, for a Quay at Tunkaria Bunder, and for a Creek-clearance

and Wharf at Gogo; they likewise propose the extension of the Broach Floating Pier.

15. The only work fully executed last year has been the Chaput Bunder Jetty at Surat, which was completed at a cost of Rs. 8,499-8-1, and is formed of wood, with a roadway twenty feet in width with a length of 210 feet, and terminating in a flight of steps leading down to low-water mark.

16. The Broach Floating Pier has been in progress, and would have been finished, but for a deficiency in timber. The same may be said of the small Hard that has been built opposite the Nowree Bunder at Surat.

17. The expenditure for the year has been as follows, viz :—

Description of Works.	Estimated Total Cost.			Expended during the Year.			Total Expenditure.		
	Rs.	*a.*	*p.*	*Rs.*	*a.*	*p.*	*Rs.*	*a.*	*p.*
Constructing a Wooden Jetty at the Chaput Bunder of Surat	10,027	0	0	8,499	8	1	10,435	12	11
Terminal Steps to ditto ditto	450	0	0						
Constructing a Hard on the other side of the River Taptee opposite the Nowree Bunder of Surat	2,844	0	0	2,532	7	8	2,532	7	8
Constructing a Floating Pier at Broach near the Custom House at that Station.	17,276	0	0	10,938	6	11	10,938	6	11
Total.... Rs.	30,597	0	0	21,970	6	8	23,906	11	6

18. Under this head there has been a marked improvement upon last year, but still the increase is trifling in comparison with the importance and urgent need there exists for works of this description in this Division.

Light Houses and Beacons.

19. During the earlier part of the year, the lights placed at Deojuggon and Khoon Bunder, on the western and eastern shores of the Gulf of Cambay, were completed; but as a description of them has already been given, it appears unnecessary to say anything further, than that they have acted well, and that the Guzerat Ports Committee have it in contemplation to recommend that the lights at Peerum and Vaux's Tomb be removed, and replaced by others made up on a principle similar to that of the Deojuggon and Khoon Bunder lights.

20. The Committee are also inclined to advocate the erection of a couple more lights along the shores of the Gulf, and they intend to propose a new style of light for the landing-places at the different ports.

21. A hut was erected at the beacon at Khoon Bunder for the use of the Lascars stationed there, and it is feared that the beacon will have to be moved further inland, the sea having lately much encroached on the spit of land on which the beacon is situated.

22. The expenditure under this head has been as follows, viz:—

Description of Works.	Estimated Total Cost.			Expended during the Year.			Total Expenditure.		
	Rs.	*a.*	*p.*	*Rs.*	*a.*	*p.*	*Rs.*	*a.*	*p.*
Putting up Lights at Deojuggon and Khoon Bunder	3,512	0	0	411	13	4	3,512	1	4
Constructing a Shed for the Lascars in the Beacon at Khoon Bunder	599	0	0	750	13	5	750	13	5
Total.... Rs.	4,111	0	0	1,162	10	9	4,262	14	9

Reclamation of Land from the Sea.

23. The Deputy Commissioner of Customs, in 1848, brought to the notice of Government the expense annually incurred in watching the borders of a marsh called the Oojul Ban, near Jullalpore, in the Parchole Purgunna of the Surat Collectorate, so as to prevent any of the salt, deposited in it on the reflux of the spring tides, from being carried away by the people living in the vicinity; and he recommended that such arrangements should be made as to preclude any deposit being formed.

24. An estimate for the reclamation of a portion of the marsh was submitted by this Department; but the Superintending Engineer being of opinion that all useful objects would be attained by draining the marsh by artificial channels, the estimate was not sanctioned, and a series of trenches were instead excavated. The marsh being upwards of eleven miles in length and four or five in breadth with but little outfall, it was soon discovered that the trenches required to be annually cleared, otherwise they ceased to act. These repeated excavations proving a source of continual expense, a reference was again made to this Department, which again recommended that a part of

the marsh should be reclaimed from the sea, and submitted an estimate with that view. This estimate appears to have met with approval, but, pending a decision as to whether the whole marsh or only a portion of it be reclaimed, it has not been sanctioned.

Canals, Irrigational Bundaras, Tanks, and Wells.

25. It is well known that the irrigational works of Guzerat consist of nothing but petty tanks, not retaining water after the end of October, and wells. Neither of these classes of works usually come under the superintendence of this Department; but last year, under an emergent requisition from the Collector, the repair of the waste weir of a small tank at Kolwa, near Gundavee, was carried out. The work, however, is of too petty a nature to merit notice in a general report.

26. Colonel Grant, lately of the Engineers, in a pamphlet published in 1851, sketched out, among many other projects, one for connecting the Taptee and Nurbudda by a canal. Mr. Liddell, the late Collector of Surat, having in a letter to Government strongly advocated the execution of this work, Government referred the matter for the report of this Department. Surveys were commenced in December 1856, with a view of determining the feasibility or otherwise of the proposals, but the sudden removal, to Persia, of the Overseer employed on the survey, put a stop to it before half completed. Enough, however, had been done to prove satisfactorily that irrigation was feasible, and that there lay every hope of its being in a pecuniary view highly profitable. The subject is now under the consideration of Government, and will be treated of in the next report.

27. Subjoined is a Memorandum of the expenditure:—

Description of Works.	Estimated Total Cost.			Expended during the Year.			Total Expenditure.		
	Rs.	*a.*	*p.*	*Rs.*	*a.*	*p.*	*Rs.*	*a.*	*p.*
Making Improvements to the Masonry Escape in the Bheem Tullaw, in the Village of Kolwa, in the Soopa Purgunna of the Surat Zillah.....	261	0	0	186	9	10	186	9	10
Total.... Rs.	261	0	0	186	9	10	186	9	10

Fortifications, Magazines, Military Store-houses and Offices, &c.

28. Walls environ the Cities of Surat and Broach and Gogo, but their conservation has lapsed into a Municipal affair, and they receive no attention from this Department. The Castle of Surat is the only fortification which is superintended by this Department. It is in a dilapidated condition; its timbers are in most places rotten; the roofs are cracked. It is useless, however, to go to the expense of making thorough repairs. They would, as far as the timber-work was concerned, amount in some places to nearly a restoration. All that can be done, and all that is done, is to renew whatever appears to be in danger of falling.

29. The Pendalls of the 9th Regiment Native Infantry at Surat, the Pendalls of the detachment of the Grenadier Regiment Native Infantry at Broach, and a Pendall of a detachment of Artillery at Surat, together with Quarter Guards, Store-rooms, Hospitals, &c., form the other works included in the category of Military buildings in this Division.

30. The Pendalls at Surat have been condemned as unhealthy and unfit for the residence of Sepoys. On the departure of the 9th Regiment they are to be taken down, and the relieving Regiment is to build huts for the accommodation of its men.

31. The Pendalls for the Artillery at Surat, and for the detachment at Broach, are in pretty fair order.

32. During the period under review, in addition to the usual endless repairs and petty works executed, a shed was erected for the bullocks of the Artillery detachment, and a sewer was partially made for draining the drill parade ground from water which now passes down a nullah that is to be filled up.

33. A list of the works executed is appended below:—

Description of Works.	Estimated Total Cost.			Expended during the Year.			Total Expenditure.		
	Rs.	*a.*	*p.*	*Rs.*	*a.*	*p.*	*Rs.*	*a.*	*p.*
Making Partitions and Ceiling to the Fort Adjutant's Office at Surat	133	0	0	89	2	0	89	2	0
Constructing a Shed for the Bullocks of the Artillery Detachment at Surat ..	1,158	0	0	1,564	11	6	1,564	11	6
Making thorough repairs to the Roads in the Surat Cantonment	870	0	0	756	1	11	756	1	11
Turning two Windows into Doors of the Executive Engineer's Office at Surat..	44	0	0	52	0	1	52	0	1
Supplying Office Furniture to the Executive Engineer's Office at Surat	90	0	0	86	0	0	86	0	0
Reconstructing a small Well on the Parade Ground and renewing a Beam in the Pendalls of the 6th Company 9th Regt. N. I.	110	0	0	145	12	7	145	12	7
Filling in a Nullah now intersecting the Cantonment of Surat near the Drill Ground, and providing a Sewer for the discharge of water	1,387	0	0	733	6	1	733	6	1
Constructing a Road from the Main Road to the Commissariat Bullock Shed and from it to a Well close by, and for repairs and additions to a Well, &c.	352	0	0	90	9	10	90	9	10
Total.... Rs.	4,144	0	0	3,517	12	0	3,517	12	0

Schools.

34. None in this Division.

Barracks and Buildings connected therewith.

35. There are no European troops stationed in this Division, and the barracks in the Castle, formerly used by the Company of Artillery, have been converted into store-rooms and offices.

Hospitals.

36. A proposal was made by the Political Agent in Kattiawar for the construction of a Hospital at Rajcote, and this Department was called upon for a design; but the demands upon the time of the

Executive Officers precluded them from attending to the requisition. The Hospitals at Surat and Broach have received no additions during the course of the year.

Churches, Burial-Grounds, &c.

37. A wooden railing has been built round the Church at Broach. The planking of the balcony of the Surat Church has been renewed.

38. The following is the detail of the expenditure :—

Description of Works.	Estimated Total Cost.			Expended during the Year.			Total Expenditure.		
	Rs.	*a.*	*p.*	*Rs.*	*a.*	*p.*	*Rs.*	*a.*	*p.*
Extraordinary Repairs to the Balcony in the Surat Church	600	0	0	544	2	11	544	2	11
Constructing a Compound Railing round the Church at Broach	981	0	0	897	3	8	897	3	8
Total.... Rs.	1,581	0	0	1,441	6	7	1,441	6	7

Jails and Buildings for Police purposes.

39. Correspondence has passed to a considerable extent regarding the Jails at Broach and Surat. After numerous plans had been prepared for the former, it was finally determined that a few temporary sheds for privies would meet all wants. This has been done, and the correspondence is now at a close.

40. The Surat Jail has had several alterations to it sanctioned. A new hospital is being constructed over the gateway; a large additional piece of ground is being enclosed, and a fresh entrance is being made to the Civil Jail. The work is in progress.

41. In two different corners of the Surat Collectorate two sheds have been erected for the Police. They are petty works, and need no notice.

42. Subjoined is a Memorandum of the expenditure:—

Description of Works.	Estimated Total Cost.	Expended during the Year.	Total Expenditure.
	Rs. a. p.	*Rs. a. p.*	*Rs. a. p.*
Constructing a substantial Guard Room for the Police of Urnala.....	Estimated. 295 0 0 Contract. 274 0 0	274 12 11	274 12 11
Constructing a substantial Guard Room for the Police at Moj-Kurrunj	Estimated. 256 0 0 Contract. 225 0 0	125 11 0	125 11 0
Making Improvements to the Surat Jail.	5,373 3 9	886 12 1	886 12 1
Total.... Rs.	5,872 3 9	1,287 4 0	1,287 4 0

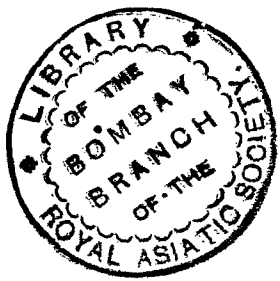
Miscellaneous.—Government Houses, Cutcherries, Travellers' Bungalows, Dhurrumsallas, Post Offices, Ferries, Telegraph Stations, &c.

43. Among the most important of the works under this head, are the additional Cutcherry for the Collector of Broach, two Travellers' Bungalows at Vullah and Burwullah in Kattiawar, a Cutcherry for the Mamlutdar of Wagra in the Broach Zillah, and a Record-room for the Mamlutdar of Koorsud in the Surat Zillah. None of these works possess sufficient general interest to render it necessary to enter into any detail of their arrangements. Plans have been prepared for a Mamlutdar's Cutcherry at Gogo, but they have been the subject as yet only of repeated references.

44. The only project under the head Miscellaneous, which appears worthy of attention, is that for supplying Gogo with water. The matter is one which has frequently been considered, which has elicited reports from all quarters, and which perhaps is rather difficult of determination. On a petition being presented to the Right Honorable the Governor in his tour through Guzerat, an order was issued to this Department to re-examine the subject. The result of this re-examination was a recommendation in favour of a new source of supply, the Bhoomlee Nullah. The Collector and Government have recorded their approval of this scheme, and the details are now to be arranged.

45. The principal heads of expenditure are as follows:—

Description of Works.	Estimated Total Cost.			Expended during the Year.			Total Expenditure.		
	Rs.	*a.*	*p.*	*Rs.*	*a.*	*p.*	*Rs.*	*a.*	*p.*
Building Peons' Sheds at the Travellers' Bungalows under the Executive Engineer Surat and Broach Collectorates	700	0	0	72	4	5	692	15	3
Providing Punkas in each Room of the 17 Travellers' Bungalows under the Executive Engineer Surat and Broach Collectorates	340	0	0	236	6	4	236	6	4
Supplying Teapoys, Pegs, and Shelves on Brackets in each Room of the 17 Travellers' Bungalows under the Executive Engineer Surat and Broach Collectorates	544	0	0	429	6	5	429	6	5
Constructing a Record-Room in the Mamlutdar's Cutcherry at Koorsud	1,812	1	10	342	1	0	342	1	0
Making thorough repairs to the Moonsiff's Cutcherry at Bardollee in the Surat Zillah	634	0	0	610	13	2	610	13	2
Constructing a Room for the Confinement of Revenue Defaulters in the Mamlutdar's Cutcherry at Surat	205	0	0	165	1	8	165	1	8
Constructing Record Stands in the Record-Room of the Mamlutdar's Cutcherry at Koorsud	484	0	0	237	13	6	237	13	6
Keeping in repair for one year the three Made Roads round Surat	1,628	0	0	1,629	4	11	1,629	4	11
Making certain alterations to the Moonsiff's Cutcherry at Bardollee	116	0	0	107	9	5	107	9	5
Ordinary Repairs to the Military Buildings at Surat	422	0	0	228	11	0	228	11	0
Ordinary Repairs to the Revenue Survey Office at Surat	4	0	0	3	9	0	3	9	0
Making ordinary repairs to the Military Buildings at Broach	96	0	0	74	15	0	74	15	0
Constructing a Mamlutdar's Cutcherry at Wagra	5,176	0	0	222	10	7	222	10	7
Making an addition to the Collector's Cutcherry at Broach	7,050	0	0	7,584	5	6	7,584	5	6
Making extraordinary repairs to the Treasure-Room of the Mamlutdar's Cutcherry at Jumbooseer	366	0	0	335	11	6	335	11	6
Supplying two new Cots to the Travellers' Bungalow at Vertez	30	0	0	25	8	0	25	8	0
Repairing a Wooden Revetment in front of the Dutch Bunder at Surat	439	0	0	188	9	0	188	9	0
Carried forward ..... Rs.	20,046	1	10	12,494	12	5	13,115	7	3


LIBRARY
OF THE
BOMBAY
BRANCH
OF THE
ROYAL ASIATIC SOCIETY

TRACE

Showing the District under the charge

of the

EXECUTIVE ENGINEER,

SURAT & BROACH COLLECTORATES.

REFERENCE

Black, line of Railway.

Burnt Sienna, line, Constructed Road.

Dotted Burnt Sienna line, Roads under Construction.

Dotted Black, Proposed Roads.

Green Verditer for Borders.

(Sigd) J.S. Trevor, Lieutenant,

Execu. Engr. Surat & Broach Collects.

Drawn on Tracing by H. Rosario.

H.E.S. Press

Description of Works.	Estimated Total Cost.			Expended during the Year.			Total Expenditure.		
	Rs.	*a.*	*p.*	*Rs.*	*a.*	*p.*	*Rs.*	*a.*	*p.*
Brought over....	20,046	1	10	12,494	12	5	13,115	7	3
Filling in large holes in the Parade Ground at Surat and repairing the Floor of the Artillery Quarter Guard.	500	0	0	460	12	0	460	12	0
Petty Repairs to the Judicial Buildings at Ahmode.....	1,171	0	0	21	10	6	1,083	8	9
Erecting Travellers' Bungalows at Burwallah and Vullah on the New Road from Gogo to Dhundooka.....	4,332	0	0	3,224	13	6	3,224	13	6
Petty Repairs and Petty Charges.....	....			3,122	10	0	3,122	10	0
Total.... Rs.	26,049	1	10	19,324	10	5	21,007	3	6

46. In conclusion it may perhaps be advisable to note the expenditure in establishment of the period under review and of the preceding year. The number of Engineers have been the same, viz. two. The superintending establishment has increased from an average of 10 to an average of 13; the total charges have not much varied, viz:—

In the year 1855-56.....Rs. 23,057 4 5
In the year 1856-57..... 22,573 11 6

47. The expenditure on works has, however, increased from Rs. 58,099-15-6 to Rs. 1,37,180-3-1, or 136 per cent. The number of plans and estimates submitted and approved has also been in excess of former years. These results might, on the whole, have been termed satisfactory, but for the unfortunate causes which have sprung up to delay the execution of works whose details were matured and approved, and whose necessity had been long recognised by all the different Authorities. These causes have in a great measure rendered nugatory all the labours of the year, and no other term than middling can be applied to the result of the year's administration.

J. S. Trevor, Lieutenant,

Acting Executive Engineer, Surat and Broach Collectorates.

Executive Engineer's Office, Surat and Broach Collectorates,
Surat, 26th June 1857.

No. 3930 OF 1857.

PUBLIC WORKS DEPARTMENT.

Office of Chief Engineer of Public Works,
Bombay, 25th July 1857.

I submit the foregoing for the information of His Lordship in Council, with reference to the Government Resolution under Mr. Secretary Hart's Memo. No. 1806, of the 27th November 1855.

2. This is a full and clear report of Lieutenant Trevor's proceedings during the past official year, which have been very creditable to that Officer's activity and intelligence, both as Acting Executive Engineer and Member of the Guzerat Ports Committee. The first work of which he writes, viz. that part of the Bulsar and Peint Road which lies within his District, twenty-one miles, has been directed by Government to be included in the next Statement for review. The masonry hard on the north bank of the Taptee, and the communication from thence to Randier, one and half mile, spoken of in Lieutenant Trevor's 4th paragraph, were sanctioned by me under the Ferry Rules 4 and 5. Lieutenant Trevor proposes to carry on this road from Randier *viâ* Eloo, Hansoot, Unklesur, Broach, and Ahmode, to the Myhee River on the route to Kaira, and states that surveys are in progress (paras. 5 and 6), as also of a branch from Tunkaria Bunder to Jumbooseer. The projected bridge over the Dadhur Creek is between Jumbooseer and Ahmode, and Lieutenant Trevor explains that it will be most useful, by opening a way for the Cotton from the Ahmode and neighbouring Districts to Tunkaria Bunder, and also for the dawk to Kaira.

No. 1916, of 3rd July 1857.

Government Notification 5th August 1851, page 936, Government Gazette.

No. 41 in Statement 1 of Budget for 1857-58.

3. On the Gogo and Ahmedabad Road (para. 8) good progress would have been made if the work had not been suspended on the remote prospect of a possible future Railway to connect these towns.

Lieutenant Trevor cannot deplore (para. 47) more than I do this arrest, when half finished, of the first road of any length or importance as yet attempted in Guzerat. Between Gogo and Vertez, sixteen and a half miles, the road is on the Rajkote as well as Ahmedabad line, and this portion is by permission of Government to be completed. There are nine* bridges on it, of which one is finished and eight are in hand. The metalling of this piece of road is provided for in the Budget for this year; but as it is joined with other items, and they must go together for sanction to the Honorable Court, the execution of this part of the work (the metalling) cannot be reckoned on with any certainty. Between Vertez and Dhundooka, fifty-one and a half miles, the embankment is far advanced, as are also the smaller culverts, and an estimate for completing them has been inserted in this year's Budget; but the estimate for bridges has been excluded by Government, on the ground that this embankment might possibly serve for a Railway. The road will, under these circumstances, remain almost without value, as the streams are numerous and difficult to cross.

No. 42, Statement 1 of Budget for 1857-58.

No. 43, Statement 1 of Budget 1857-58.

4. The only remaining road to be noticed is an embankment of five miles (para. 10) over the marsh between Dhollera and Khoon Bunder, recommended by the Guzerat Ports Committeee and sanctioned by Government. A small portion of it only had been constructed before the close of last official year.

5. In his 12th paragraph, Lieutenant Trevor contrasts the expenditure on roads during the past official year with that of the preceding six years. As compared with 1855-56, it has increased from Rs. 36,546 to Rs. 88,289, and it would have been much larger if the principal work had not been suspended.

6. Lieutenant Trevor is of opinion that "wharves, jetties, and river clearances" should "form a considerable portion of the duties of the Executive Engineer" of Surat, who has all the ports of Guzerat with "a trade of at least five millions sterling" under his charge. According to Mr. Stewart's report, the exports and imports in 1853-54

* Lieutenant Trevor's present Report states eleven bridges, a mistake it is believed.

were in value £3,400,000 only, but even this amount is large enough to justify considerable expenditure in providing such facilities as Civil Engineering can devise. The improvement of rivers and of harbours is a most uncertain and costly operation. Wharves and jetties are an obvious and comparatively cheap accommodation, and to these the recommendations of the Ports Committee have been chiefly directed. Lieutenant Trevor in his 14th paragraph enumerates six projects, one of which is sanctioned for review and one only in contemplation. For the remaining four, designs are in course of preparation.

No. 1228, 4th May 1857.

7. With respect to work executed, the floating pier at Broach is still incomplete for want of timber, and the hard opposite the Nowree Bunder at Surat. The Chaput Bunder Jetty at Surat, 210 feet by 20 feet, with a flight of steps to low-water, is finished, and has cost Rs. 10,436. The lights at Deojuggun on the eastern, and Khoon Bunder on the western side of the Gulf of Cambay, completed early in the year, have given so much satisfaction, that the Committee propose to replace the lights at Perim and Vaux's Tomb by lights similar to those recently put up at Deojuggun and Khoon Bunder, and to erect two additional lights in the Gulf. They also propose a better light for landing-places. The beacon and Lascars' hut at Khoon Bunder have been so much encroached on, that Lieutenant Trevor fears they must be removed (para. 21).

8. The question of reclamation of the Oojul Ban and the project for irrigation from the Taptee, referred to by Lieutenant Trevor in paras. 23 to 26, have been submitted to Government in letters No. 3794, of the 18th July, and No. 2401, of the 5th May 1857.

9. A railing has been erected round the Church at Broach, and the balcony of the Surat Church has been restored. Alterations to the Surat Jail are in progress, and Police sheds have been erected at Urnala and Moj-kurunj (paras. 37 to 42).

10. Under the head "Miscellaneous," Lieutenant Trevor reports the completion of an additional Cutcherry for the Collector at Broach. A Cutcherry for the Mamlutdar of Wagra, Broach Zillah, and a Record-room for the Mamlutdar of Koorsud, Surat Zillah, have been

commenced in 1856-57, and the two Travellers' Bungalows at Vullah and Barwullah, on the Gogo and Ahmedabad Road, are well advanced (paras. 43 to 45).

11. Finally, Lieutenant Trevor reports that while the expenditure during the year 1856-57, as compared with that of 1855-56, has increased from Rs. 58,100 to Rs. 1,37,180, the cost of established superintendence (salaries of Engineer Officers and subordinates) has slightly decreased, viz. from Rs. 23,057 to Rs. 22,574, the latter showing a per-centage of 14·13 on the gross expenditure of Rs. 1,59,754 for the past year. Lieutenant Trevor is nevertheless dissatisfied with the results of his administration during the year, but it is obvious that no fault is to be imputed to him: he has exerted himself strenuously, and the partial failure of his exertions has been from causes beyond his control.

C. WADDINGTON, Major General,
Chief Engineer of Public Works.

AHMEDABAD AND KAIRA.

No. 137 of 1857-58.

To the Superintending Engineer Northern Province,

Surat.

Sir,—I have the honour to forward the report required from this Office on the progress of the principal works undertaken in the Ahmedabad and Kaira Collectorates during the year 1856-57, and as called for in your Circular Memo. No. 3459, of the 18th of April 1857.

New Road between Ahmedabad and Gogo.

2. The works on the new road between Ahmedabad and Dhundooka, which I attempted to describe in my last year's report, have been proceeded with but slowly during the past official year, owing to want of proper superintendence.

Embankment.

3. The length of embankment formed during the year is 8 miles 5 furlongs and 123 yards, which, with the work executed in formers years, gives a total of 55 miles 1 furlong 149 yards and 2 feet.

Embankment remaining to be done.

4. Only 2 miles 66 yards and 2 feet remain to be embanked, and the whole ought therefore to be completed before the monsoon. 13,432 running feet have been left untouched, to allow of the passage of the floods of the different rivers intersecting the line.

Bridges on this Road.

5. During the last year the whole of the piers and abutments, and two of the arches of the Bhandur River Bridge, near Dhundooka, have been built; but, owing to the cause alluded to above, the bridge will not be completed this year as I anticipated.

The bridge is to consist of twelve arches of twenty feet span each, with versed sines of four feet; and its estimated cost is Rs. 8,932.

6. Owing to the impossibility of building all the arches of this bridge before the approaching monsoon, the construction of an abutment pier has been rendered necessary.

Abutment Pier.

7. This bridge, for want of superintendence, was only commenced at the termination of the past official year; but it is anticipated that before the monsoon commences the foundations of the piers and abutments will have been laid.

Bhandur Bridge at Jallia.

The design provides for six openings of twenty feet span each, the rise of the arches being one-fifth of the span; and the amount of the estimate is Rs. 3,336.

8. A culvert of four openings of ten feet span each, with versed sines of two feet, has been built at Jallia, and several large barrel drains or culverts have been built during the year, or are in course of construction, as below:—

Culverts and Drains.

A culvert consisting of three circular openings of eight feet diameter each, has been completed at Dhundooka.

Ditto ditto, of seven circular openings of eight feet diameter each, has been nearly built at Jallia.

And the following barrel drains of smaller dimensions, viz:—

4 of six	openings,	varying from	3 to 7	feet in diameter.
2 of five	ditto,	of	6	ditto.
2 of seven	ditto,	of	$4\frac{1}{2}$	ditto.
1 of five	ditto,	of	$4\frac{1}{2}$	ditto.
2 of four	ditto,	varying from	4 to $4\frac{1}{2}$	ditto.
1 of twelve	ditto,	of	3	ditto.
4 of three	ditto,	varying from	3 to 4	ditto.
1 of two	ditto,	of	4	ditto.
21 of one	ditto,	varying from	2 to 7	ditto.

9. The number of culverts and drains constructed on this line of road, up to the 30th April 1856, was 51, which, added to those built during the past official year, makes a total of eighty-five drains and culverts *completed*, and 4 nearly completed.

10. The following designs for large masonry works required along this line of road, were submitted for the sanction of Government during the past official year; but they have been laid aside until the question of the conversion of this road into a Railroad has been definitively settled.

Designs.

11. A design for a bridge over the Kharree Wassul River. This design provides for a bridge with five openings of 18·32 feet span each, and versed sines of four feet. The estimated amount for this work is Rs. 4,468.

Kharree Wassul Bridge.

12. Designs for two bridges over the Limree Bhogawa River, one of which provides for 140 running feet of waterway, and spans the main part of the river by means of seven arches of twenty feet span each with four feet rise; and the other is designed to carry off the surplus water on occasions of very heavy floods, and consists of ten arches of ten feet span each and versed sines of one-fifth the span. The estimated amount for these bridges is Rs. 9,990.

Limree Boghawa Bridges.

13. The next design is for a viaduct across the Hurbur River, which, during the monsoon months flows with a considerable volume extending over a large surface. The stream is shallow, but yet cannot be contracted to a very great extent, owing to the level nature of the adjacent country. The arches, which are necessarily made of the small span of ten feet, are 113 in number, providing a waterway of 1,130 running feet. The estimated amount for this work is Rs. 32,674.

Hurbur River Viaduct.

14. The design for the viaduct over the Meetapoor Nullah is of a similar description to that above described, but consists of only of twelve arches of ten feet span each. The estimated amount for this work is Rs. 3,951.

Meetapoor Bridge.

15. Designs for viaducts for the Buggodra and Roheeka Nulls were also submitted, but I did not prepare estimates of the probable cost of their construction, being of opinion that the waterway might be considerably diminished.

Buggodra and Roheeka Viaducts.

16. The correctness or otherwise of this supposition, however, I have been unable to determine, for want of a subordinate to take the extensive levels necessary to admit of a correct conclusion being arrived at.

Plan and Section of New Road.

17. A plan and longitudinal section of the whole line of road from Ahmedabad to Dhundooka have also been furnished.

Estimates for Metalling the Roadway.

18. And an estimate of the probable cost of metalling the portion of road under my charge, which, owing to the enormous distances from which stone would have to be brought for that purpose, amounts to the excessively large sum of Rs. 8,79,857.

Amounts expended on the above Works.

19. The amounts expended on the works above alluded to are as follows:—

On the embankment of the new road, including culverts and drains—

Amount expended, including that disbursed in former years ..... Rs.	1,21,456	11	7
Balance of estimate is therefore	23,263	4	5
Amount expended on the Bhandur River Bridge near Dhundooka	3,683	12	7
Balance of estimate is therefore	5,248	3	5
Amount expended on the Bhandur Bridge at Jallia	62	14	3
Balance of estimate is therefore	3,273	1	9

Sketch and Estimate for Branch Line of Road between Dholka and Bhaeela.

20. In accordance with instructions from the Chief Engineer of Public Works, I made a survey of the country between Dholka and Bhesela, with the view of constructing a branch road to connect Dholka with the trunk line; and I prepared and forwarded a sketch and sections thereof, with an estimate of the probable cost of its execution.

Estimate for ditto.

21. The estimate for the formation of the required embankment, and the construction of the necessary masonry drains, amounts to Rs. 16,748; and that for

metalling the roadway, which is only eight miles and sixty feet in length, amounts to Rs. 1,19,250.

Cantonment Roads at Baroda.

22. The Cantonment roads at Baroda have undergone extraordinary repairs during the past year. For this work Rs. 2,798 were sanctioned ; of which sum Rs. 1,484-4-1 were spent during the year 1855-56, and during the past year Rs. 1,302-9-3 have been expended.

Extra Municipal Roads at Ahmedabad.

23. The extra Municipal roads at Ahmedabad have been repaired at a cost of Rs. 6,591-15-3, which sum includes the amount expended on watering the roadway twice a day during the fair season.

Bridge at Baroda.

24. The bridge at Baroda, of which a full description was given in my last report, was completed on the 24th December 1856, and the whole amount of contract, or Rs. 2,750, has been paid to the Contractor.

Bridge at Summadra.

25. A bridge has been constructed at Summadra over a new channel formed to divert the course of a stream from entering the tank near that village.

Description of ditto.

26. The bridge consists of one arch of twenty-five feet span with a rise of five feet, and is constructed of burnt-brick and choonam masonry. The new channel excavated is 1,973 feet in length and twenty-five feet wide.

Amount of Contract for Work.

27. The amount of the contract for this work, viz. Rs. 2,189, has been paid to the Contractor.

Tanks.

28. The repairs to the tank at Khoontej, described in my last report as having been commenced, were completed during the past year, and the whole of the contract amount was paid to the Contractor, viz. Rs. 2,848.

Dams.

29. A masonry bund across the Kupprapoor Nulla has been built by contract during the past official year; the amount of the contract for which is Rs. 1,785.

Civil Buildings.

30. A new building has been commenced, to afford extra accommodation to the Carcoons employed in the Collector's Cutcherry.

Additional accommodation to the Collector's Cutcherry at Ahmedabad.

31. This work is being performed by contract for Rs. 3,178, and is nearly completed.

Sudder Distillery at Kaira.

32. The Distillery at Kaira has been converted into a Civil Hospital, at a cost of Rs. 1,682-0-4. This work was completed on the 7th April 1857; the saving on the estimated amount being Rs. 108-15-8.

Military Buildings.

33. No Military works of importance have been executed by this Department during the past year; but the wells at Baroda, which were alluded to in my report of last year, as having been commenced, were completed on the 18th August 1856.

The sum expended on this work during the year 1855-56 was ..... Rs.	882	9	2
And that spent during 1856-57	1,511	6	0
The balance on the estimate or saving effected is therefore ..... Rs.	1,151	0	10

Charitable Works; Hutteesing and Premabhoy Hospital.

34. During the past year also a charitable institution, called the "Hutteesing and Premabhoy Hospital," has been commenced under the auspices of Government; the Right Honorable the Governor, Lord Elphinstone, G.C.H., having laid the foundation stone thereof on the occasion of visiting Ahmedabad in the month of December 1855.

Amount of Contract and Designs, &c. for Work, and where prepared.

35. The work has been given in contract for Rs. 30,400, and is now considerably advanced. The designs and estimates for the work were furnished from, and its execution is being superintended by, this Department.

Description of Hospital.

36. The Hospital consists of three buildings, one main and two wings. The former contains two Sick wards, each 60 × 26, a Dispensary 26 × 24, and a Surgery of similar dimensions, surrounded by an open verandah 10 feet in width; and the two wings are Ophthalmic and Lying-in wards, each 31 × 18, with an open verandah 10 feet in width.

Ahmedabad Water-Works.

37. The Water-Works, which are being constructed from the Town-wall Fund, for the purpose of furnishing water to the citizens of Ahmedabad. This work was commenced in the year 1850-51, and on the 1st February 1857, one set of Persian-wheels was completed; since when about 25,000 gallons of water have been daily supplied.

How water raised.

38. The water is drawn from the Saburmuttee River by means of bullocks; it is filtered in the main reservoir, and thence, by means of earthen pipes, conducted to cisterns (open and closed) situated within the City-walls.

Future intentions regarding ditto.

39. Another set of Persian-wheels is nearly ready, and if the pipes will admit of more water being passed through them than can be lifted by the two sets, the work will be still further extended.

Amount expended on ditto.

40. The sum expended on this work already amount to Rs. 64,000, and the cost has been defrayed by taxes levied within the City of Ahmedabad.

Ordinary Repairs.

41. The usual ordinary repairs have been effected to the Military buildings at Ahmedabad and Baroda by this Department, as also to the Civil buildings under the Collector of Ahmedabad; and numerous works of emergency to buildings in every Department have been carried into execution.

Establishment.

42. During the past official year the following Establishment has been employed in the Ahmedabad and Kaira Collectorates and at Baroda:—

An Executive Engineer.....	Capain C. Scott.
An Assistant Executive Engineer.	Lieutenant Griffith.
A Surveyor and Builder	Kahandas Muncharam.
An Overseer	Serjeant G. Cowper.
Two Assistant Overseers	Serjeant Sweeny.
	Serjeant Harding.
An Asst. Surveyor and Builder ..	Balcrustna Meyaram.

One Probationary 1st Class Sub-Asst. Surveyor and Builder..	Muncherjee Bazenjee.
2nd Class Sub-Assistant Surveyors and Builders	Mr. Moise.
	Govind Atmaram.
	Furdoonjee Jemsetjee.
	Gunesh Nilkunt.
	Gungadhur Venayek.
	Rowjee Narayen.
	Silvester Gonsalves.
	Oomakaunt Mahadeo.

How stationed.

43. Lieutenant Griffith performed no duty during the past official year. He was sent from under my control to take charge of the Executive Engineer's Office at Deesa on the 5th July 1856, and when returning from that Station was attacked by fever, and reached Ahmedabad in a dying condition. By unremitting attention on the part of his Medical attendant, he slowly recovered, but was forced to quit Guzerat for a more genial climate, and he left Ahmedabad on the 1st November 1856.

44. Kahandas Muncharam joined my Office on the 18th of June 1856, and has been employed in superintending the extensive Public Works at Ahmedabad.

45. Serjeant Cowper has been employed at Baroda in superintending the works and repairs to buildings at that Station.

46. Serjeant Sweeny proceeded to Kupprapoor to mark out and commence the Bund at that place; on the completion of which duty he was removed to a subordinate charge, on the new road between Ahmedabad and Dundooka.

47. Serjeant Harding was employed in superintending the construction of the Summadra Bridge and the conversion of the Sudder Distillery at Kaira into a Civil Hospital, up to the period of his being remanded to the Corps of Sappers and Miners. He left this Office on the 28th of December 1856.

48. Balcrustna Meyaram left my Office on the 6th June 1856, to proceed to Sind, in accordance with orders received from the

Chief Engineer of Public Works. He was employed at Baroda up to that period in superintending the works in progress at that Station, and was removed for misconducting the work entrusted to his charge.

49. Mr. Moise, up to the date of leaving the Department, accompanied me into the Districts, giving me his assistance, when necessary, in the execution of out-door duties, as also in the preparation of plans and estimates. He applied for his discharge from Government service, and his request being acceded to, he left my Office on the 15th of April 1857.

50. Muncherjee Bazenjee, Govind Atmaram, and Gunesh Nilkunt have been employed on the new line of road under my charge, and in the construction of the Travellers' Bungalows at Boula, Buggodra, and Dhundooka.

51. Furdoonjee Jemsetjee was employed on the same work up to the 28th February 1857, since when he has been engaged in examining plans and estimates in my Office.

52. Gungadhur Venayek, while under my control, was employed on the new road between Ahmedabad and Dhundooka. He left my Office on the 5th July 1856.

53. The other two young Surveyors and Builders, viz. Rowjee Narayen and Silvester Gonsalves, have been placed under the orders of Kahandas Muncharam, to assist him in the performance of his duty at Ahmedabad; and Oomakaunt Mahadeo was similarly employed until he was transferred to the Office of the Executive Engineer Surat Division. He left my Office on the 1st December 1856.

I have the honour to be, Sir,
Your most obedient Servant,

C. Scott, Captain,
Executive Engineer, Ahmedabad Division.

Camp Dhundooka, Executive Engineer's Office,
20th May 1857.

P.S.—Statements similar to those sent with a report of last year, will be prepared and forwarded at an early date.

C. Scott.

SKETCH

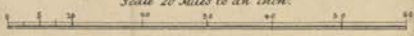
Showing the Districts under the

EXECUTIVE ENGINEER,

AHMEDABAD & KAIRA COLLECTORATES.

To accompany the Concise Report dated 20th May 1857.

Scale 20 Miles to an inch.



Ahmedabad Ex. Engrs Office,
15th January 1857.

(Signed) R. Colgrave, Lieutenant,
Adl Ex. Engr Ahmedabad & Kaira Collectorates

Drawn on Transfer by R. Rosario.

B. E. S. Press

Statement of Sums Expended on different Works under Execution in the Year 1856-57.

(To accompany Concise Report from the Executive Engineer Ahmedabad and Kaira Collectorates, No. 137, of the 20th May 1857.)

Names of Works.	Amount expended up to the 30th April 1856.			Amount expended during 1856-57.			Total.			Amount of Estimate.			Balance remaining to be expended, or remaining unexpended.		
	Rs.	*a.*	*p.*	*Rs.*	*a.*	*p.*	*Rs.*	*a.*	*p.*	*Rs.*	*a.*	*p.*	*Rs.*	*a.*	*p.*
New line of Road between Ahmedabad and Dhundooka	68,218	15	2	53,237	12	5	1,21,456	11	7	1,44,720	0	0	23,263	4	5
Constructing a Masonry Bridge across the Branch of the Bhadder River near Jallia	.....			62	14	3	62	14	3	3,336	0	0	3,273	1	9
Constructing a Bridge over the Bhaddur River at Dhundooka	.....			3,683	12	0	3,683	12	0	8,932	0	0	5,248	4	0
Constructing three Travellers' Bungalows between Dhundooka and Ahmedabad	.....			7,736	14	7	7,736	14	7	7,873	0	0	136	1	5
Providing Punkhas to the Travellers' Bungalow under the charge of the Executive Engineer Ahmedabad and Kaira Collectorates	.....			269	2	6	269	2	6	315	0	0	45	13	6
Escape Channel, and Bridge to cross it, at Summadra	.....			2,244	8	3	2,244	8	3	2,960	0	0	715	7	9
Adapting the Sudder Distillery at Kaira for a Hospital	.....			1,682	0	4	1,682	0	4	1,791	0	0	108	15	8
Constructing five Ferry Boats to ply on the Saburmuttee River at Byrampoor, Shaeebaug, Nowapoora, Buradree, and Oosmanpoora	.....			5,586	8	1	5,586	8	1	9,995	0	0	4,408	7	11
Making additional Accommodation to the Collector's Office at Ahmedabad	.....			2,075	0	0	2,075	0	0	3,494	0	0	1,419	0	0
Carried over..... Rupees	68,218	15	2	76,578	8	5	1,44,797	7	7	1,83,416	0	0	38,618	8	5

Names of Works.	Amount expended up to the 30th April 1856.			Amount expended during 1856-57.			Total.			Amount of Estimate.			Balance remaining to be expended, or remaining unexpended.		
	Rs.	*a.*	*p.*	*Rs.*	*a.*	*p.*	*Rs.*	*a.*	*p.*	*Rs.*	*a.*	*p.*	*Rs.*	*a.*	*p.*
Brought over.....	68,218	15	2	76,578	8	5	1,44,797	7	7	1,83,416	0	0	38,618	8	5
Embanking the Village Tank of Khoontej in the Mahoonda Talooka	.....			3,148	2	0	3,148	2	0	3,648	0	0	499	14	0
Making four Venetian Screen Doors in the West Verandah and Varnishing all the Doors and Windows of the Residency Bungalow at Baroda	.....			841	15	6	841	15	6	843	0	0	1	0	6
Lines for the Kooley Police Corps at Ahmedabad.....	.....			11	15	3	11	15	3	9,380	0	0	9,368	0	9
Constructing a Bridge over a Nulla which forms the Western boundary of the Camp at Baroda.....	.....			2,750	0	0	2,750	0	0	2,839	0	0	89	0	0
Sinking five Wells in the Lines of the 8th Regiment N. I. at Baroda	882	9	2	1,511	6	0	2,393	15	2	3,545	0	0	1,151	0	10
Making additions to the Serjeant Major's and Quarter Master Serjeant's Quarters of the Golundauze Detachment at Ahmedabad.	.....			.....			.....			179	0	0	179	0	0
Constructing a permanent Sentry Box for the Golundauze Detachment at Ahmedabad ..	.....			.....			.....			37	0	0	37	0	0
Repairing the Road in the Cantonment at Baroda.....	1,484	4	1	1,302	9	3	2,786	13	4	2,798	0	0	11	2	8
Constructing three Sentry Boxes for the use of the 8th Regiment N. I. at Baroda	.....			73	15	8	73	15	8	.....			.....		
Constructing two Sentry Boxes for the use of the 1st Grenadier Regiment N. I. at Baroda.	.....			49	3	2	49	3	2	.....			.....		
Draining the Lines of the 8th Regiment N. I. at Baroda	.....			89	10	2	89	10	2	.....			.....		
Constructing three Barrel Drains in the Lines															

of the 8th Regiment N. I. in the Cantonment at Baroda	.....			48	0	0	48	0	0	.....			.....		
Constructing nineteen Barrel Drains in the Lines of the 8th Regiment N. I. at Baroda.	.....			225	2	0	225	2	0	.....			.....		
Constructing a double Barrel Drain situated in the Cantonment at Ahmedabad.....	.....			40	4	1	40	4	1	.....			.....		
Making Shutters for ten Glazed Windows and new Brick Floor to the Serjeant Major's and Quarter Master Serjeant's Quarters of the 2nd Grenadier Regiment N. I. at Ahmedabad	.....			171	0	6	171	0	6	.....			.....		
Making four Iron Cowl Ventilators in the English School-room at Ahmedabad.....	.....			107	6	3	107	6	3	.....			.....		
Ordinary Repairs	.....			13,504	14	7	13,504	14	7	14,562	0	0	1,057	1	5
Emergent Repairs	.....			2,399	15	9	2,399	15	9	.....			.....		
Petty Repairs	.....			1,366	1	4	1,366	1	4	.....			.....		
Grand Total.... Company's Rupees	70,585	12	5	1,04,220	1	11	1,74,805	14	4	2,21,247	0	0	51,011	12	7

R. COTGRAVE, Lieutenant,

Acting Executive Engineer, Ahmedabad and Kaira Collectorates.

No. 1007 of 1857-58.

Public Works Department.

To the Chief Engineer of Public Works,
Bombay.

Sir,—I have the honour to acknowledge the receipt of your Assistant's Memo. No. 3743, of the 16th instant, and to make the following few remarks, suggestive of the works needed to develope the resources of the vast and fertile districts of the Province under my charge.

2. First and foremost in importance stands the irrigation of the vast Collectorates of Surat, Broach, Kaira, and Ahmedabad. It has been now proved beyond doubt that the scheme of irrigation of the two first mentioned Collectorates from the Taptee and Nurbudda Rivers is likely to be feasible and highly renumerative; but the project has been put on one side, as Government has it in contemplation to organise a Canal Department. The investigation ordered by Government in regard to the irrigational capabilities of the Myhee and Saburmuttee Rivers has not been undertaken, owing to the want of an Officer to undertake the work. I need not enlarge on the importance of these two works, as it has been already recognised by yourself and the Government. I should, however, be wanting in duty, were I not to recommend their receiving the earliest possible attention, as it is well known that no dependance can be placed on the monsoon in this part of the country. Its periods of setting in and closing are very irregular, and sometimes it so happens that the time for sowing passes away without a drop of rain. For instance this year, though the monsoon is more than half over, there is no rain; the prices of certain grains have in consequence been doubled, and in what such a state of matters, if continued, is likely to end, in a city where the bulk of the population daily live from hand to mouth, may easily be imagined.

3. The second in importance are the improvements of the ports, that of Gogo ranking foremost, and the dredging of the rivers

Taptee and Nurbudda. The first has already engaged the attention of a Committee of Officers specially appointed by Government, and it is therefore to be hoped that the desiderata of the Province in this respect will meet with due attention from Government at the earliest possible date. As regards the latter, the expense would, in my opinion, be enormous and quite out of proportion to the benefits to be expected therefrom; in fact, as already reported, I regard this scheme as being one of most doubtful success. However, I think that the project should not be altogether abandoned without a careful investigation thereof, and of its probable cost and effects.

4. The construction of the road between Ahmedabad and Deesa and the latter place and Mount Aboo, is of equal importance with the improvements of the ports of this Province, and should, if possible, receive immediate attention. This subject, along with some other projects of apparently still greater urgency, was referred for the report of the Executive Engineer Deesa Division, so long ago as 29th August 1855; but owing to the change of Officers from time to time, and numerous important Military works in progress at that Station, added to the paucity of competant hands, the Executive Engineer has hitherto been prevented from furnishing it, and it is therefore absolutely necessary that Captain Curtis should have more competent subordinates placed under him.

5. Lastly, I beg to draw attention to the state of the district roads and to that of the tanks and wells. It is only of late years that some attention has been shown to them; but, without any disparagement to Colonel Kennedy's scheme, I have no hesitation in stating that the expenditure on them annually, incurred under the Collectors, answers no useful purpose; for this simple reason, that the Collectors' Departments can never properly carry out Colonel Kennedy's proposal, and you will easily understand how much the value and utility of a scheme depends on the proper management of its details. In fact, the roads are, if possible, worse then they ever were before, when they were left altogether untouched. As regards the tanks, they are yearly diminishing in number from want of timely repairs; but as the Right Honorable the Governor has

himself taken the subject in hand, it is to be hoped that some arrangements will speedily be made for the due maintenance of these useful works. In fact a class of Maramut Maistries, consisting of seven candidates, has already been organised at Surat, but I need hardly say that some more extensive measures are required to meet the want felt for such men.

6. Before concluding this report, I must not fail to impress on your mind the necessity that exists of extending the operations of the Public Works Department in this Province. Compared to the other Provinces, I may say that it has received a very small portion of the attention of Government, owing principally to the want of Officers and men to initiate, investigate, and carry out useful projects; and I think it but just, that as this Province contributes more than any other to the Exchequer, it should at least receive equal attention. Even for the present scale of operations, limited as they are, the want of hands of all grades is greatly felt, and the Executive Engineers are daily making applications for competent subordinate assistance.

7. The several reports from the Executive Engineers are herewith re-transmitted.

I have the honour to be,

Sir,

Your most obedient Servant,

W. B. Goodfellow, Colonel,
Superintending Engineer, Northern Province.

Superintending Engineer's Office, Northern Province,
Surat, 28th July 1857.

P.S.—From Captain Munbee, of course, no report of the nature required can well be expected now. Lieutenant Trevor's was submitted with No. 702, of the 4th instant, from this Office.

W. B. G.

No. 4659 of 1857.

Public Works Department.

Office of the Chief Engineer of Public Works,
Bombay, 31st August 1857.

To the Right Honorable Lord Elphinstone, G.C.H.,
Governor and President in Council.

My Lord,—With reference to the instructions in the 5th paragraph of the Government Resolution under Mr. Secretary Hart's Memo. 1806, of the 27th November 1855, I have the honour to submit a report by Captain Scott, lately Executive Engineer Ahmedabad and Kaira Collectorates, of the operations of his Department during the past official year, with a Statement of Expenditure and a Sketch of the District by Lieutenant Cotgrave, Executive Engineer Ahmedabad and Kaira Collectorates. The report was received by me on the 1st July, together with a similar report from the Executive Engineer Deesa; but neither report being accompanied by any remarks from the Superintending Engineer, they were returned to that Officer for any observations thereon which he might wish to make. Colonel Goodfellow has now re-submitted them, with the accompanying letter, No. 1007, of the 28th ultimo. His letter makes no allusion to the Executive Officers' reports, but contains merely his suggestions for the improvement of Guzerat, which require no immediate notice, as the present disturbances debar us from any near prospect of undertaking important works. The report from the Executive Engineer Deesa Division, I shall have the honour to submit separately, and shall confine my observations in the present letter to Captain Scott's report.

2. The first work described by Captain Scott, is that part of the Gogo and Ahmedabad road which was under his superintendence, viz. from Dhundooka to Ahmedabad, the length of which is 59m. 6f. 74y. It appears from Captain Scott's report, that of this length 55m. 1f. 150y. have been embanked and furnished with cross drains, that 2m. 67y. remained to be so embanked, and 2m. 4f. 77y. were to

be left open for the construction of bridges. Only 8m. 5f. 123y. were embanked and drained in 1856-57, and Captain Scott attributes this comparatively slow progress of the past year to want of proper superintendence. From his 19th paragraph it appears that the expenditure on the embankment and drains, up to 30th April, was Rs. 1,21,457, and that he had a balance of estimate remaining, of Rs. 23,263. This result of Captain Scott's management contrasts very favorably with the very large excess of expenditure incurred or expected on that part of the road between Vurtez and Dhundooka. I am not able fully to explain this contrast, but I believe one cause has been the adoption of the simplest description of barrel drain, without foundation, wing walls, or parapets. This kind of drain was advocated and figured and described by me, and Captain Scott, after making some objections, I believe eventually adopted it. The cheapness of this drain, when adopted in its full simplicity, is extraordinary; but it is not often that our Executive Engineers have been persuaded to adopt it unencumbered with unnecessary adjuncts. The cost per foot of waterway of a large barrel drain, as compared with that of Captain Hart's massive drains, such as those for instance built by him between Sattara and Mahableshwur some years back, is, according to my calculation, in the ratio of about one to eight. It is fair to suppose, however, that Captain Scott's attention and judgment on other points, have ensured an economical management of this work. Very little has been done on this road in the shape of bridges beyond furnishing designs and estimates. One bridge alone had made some advance, viz. the Bhandur River Bridge, near Dhundooka, of twelve arches of twenty feet span: the piers and abutments were finished and two arches turned. The three Travellers' Bungalows beteen Dhundooka and Ahmedabad are not noticed in Captain Scott's report; but from the accompanying Statement by Lieutenant Cotgrave, it appears that they were nearly finished during the year.

3. The Cantonment roads at Baroda, and the extra Municipal roads at Ahmedabad, have been restored by extraordinary repairs during the past year (paras. 22 and 23), and the bridge on the western side of the Baroda Cantonments finished (para. 25). The five

wells in the Cantonment of Baroda, commenced in 1855-56, have been finished, with a large saving on their estimated cost (para. 33).

4. The escape channel at Summadra, with a bridge to cross it, has been completed, and the restoration of a tank at Khoontej carried into effect. A masonry dam across the Kupprapoor Nulla has been built (paras. 27, 28, and 29).

5. Additional accommodation to the Collector's Cutcherry at Ahmedabad is in course of construction. The conversion of the Distillery at Kaira into a Civil Hospital has been effected (paras. 30, 31, and 32). The construction of five ferry boats at Byrampoor, Shaeebagh, Nowapoora, Buradree, and Oosmanpoora, on the Saburmuttee River, is in progress (Statement).

6. Captain Scott describes (paras. 34 to 36) the plan and progress of the Hutteesing and Premabhoy Hospital at Ahmedabad, the foundation stone of which was laid by your Lordship in December 1855. The building is stated to be considerably advanced. The water-works of Ahmedabad, which were commenced in 1850-51, a restoration, I believe, of those formerly existing, appear to be completed, since Captain Scott writes that "on the 1st February 1857 one set of Persian-wheels was completed, since when 25,000 gallons of water have been daily supplied" (para. 37). He adds that another set of wheels is nearly ready, and that "the sum expended on the work already amounts to Rs. 64,000, and the cost has been defrayed by taxes levied within the City of Ahmedabad" (paras. 39 and 40). The water is raised from the Saburmuttee by bullocks, is filtered, and is conducted by earthen pipes to cisterns open and closed within the City-walls (para. 38).

7. Captain Scott complains, in more than one paragraph, of the want of assistance, either superior or subordinate, with which he was supplied. His Assistant, Lieutenant Griffith, was removed to Deesa in July 1856, but there seems to have been no want of subordinates at Captain Scott's disposal. He had an European Overseer and two European Assistant Overseers (one of whom left in December 1856); a most intelligent Surveyor and Builder, Kahundass Muncharam; one Assistant Surveyor and Builder (who, however, left early in the

year for Sind); one Probationary 1st Class Sub-Assistant Surveyor and Builder; and no fewer than eight of the 2nd Class, of whom one resigned and two were removed during 1856-57. Captain Scott states in what manner all his subordinates were employed, but makes no report or remarks on their qualifications or conduct, except that Assistant Surveyor Balcrustna Meeyaram. was "removed" from his employment at Baroda "for misconducting the works committed to his charge" (para. 48).

I have the honour to be,
My Lord,
Your Lordship's most obedient Servant,
C. WADDINGTON, Major General,
Chief Engineer of Public Works.

DEESA DIVISION.

No. 56 of 1857-58.

Public Works Department.

To Colonel W. B. Goodfellow,
Superintending Engineer Northern Province,
Surat.

Sir,—Referring to paras. 4, 5, and 6 of Government Resolution No. 1806, of the 27th November 1855, extract of which was sent with your Circular Memorandum No. 2441, of 27th December 1855, I have the honour to make the following "Concise Report" of various works commenced and executed in my Division during the past official year.

2. My last report, No. 405, of the 16th October 1856, explained the nature and class of works usually required and executed in the Deesa Division; I do not therefore think it necessary to make a repetition of them now.

3. The principal labour for the last year has been the introduction of a new system both in the Office and Operative branches of the Division. In the Office, the ledger and daily cash book have alone remained on their former footing, but regular receipt and issue accounts of stock and petty materials have been established; merchants delivering goods on the works have the same measured and certified to at once by the subordinates appointed for the purpose; lengthy nominal rolls of carpenters, masons, and labourers have been abolished as no longer necessary; irregular payments for broken periods

to work-people are at an end; and the substitution of daily pay is a simple record compared with the original morning and evening roll-calls of people, many of whom would work for a week and return a month or forty days after for their wages. All the works are now measured up, and figured abstracts filled in daily.

4. I have had unusual trouble with the Operatives; it was only by the utmost conciliation they were persuaded to work on any other than their own most preposterous terms of commencing at 8 A. M., stopping at 4 P. M., having an hour's rest at noon, and not being fined for short work: they all now come at 7 A. M., and are paid at 5 P. M. I have many bricklayers (inhabitants of Puttun) who can run up fifty feet of solid brick and lime, good masonry, well bounded and jointed throughout, in one day; whereas formerly from twenty to twenty-four cubic feet was an average day's work.

5. In the last year the new School-house and quarters for Master and Mistress have been completed and handed over to the Military Authorities, with the exception of the privies attached to the School-house, which, from shortness of hands, I found impossible to finish: they will be ready by the end of May. I am happy to say that the cracks which showed themselves in the superstructure of main walls after last rains have never increased; had they done so the plaster would have split, but it is as good and sound now as possible. This building was estimated at Rs. 16,956, had cost on the 30th April Rs. 15,531-10-8, and will probably be completed for about Rs. 15,900.

6. The building of a cook-house for the female ward of the European Hospital had materially added to the comfort and well-doing of the patients. Formerly they had an ill-constructed shed of mats and old rafters stuck up on the weather side of the ward; now there is a good substantial cookroom, 14 feet by 10 feet internally, on the lee side, and placed at a convenient distance from the main

building. Its estimated cost was Rs. 266, out of which a saving was made of Rs. 22-3-11, or nearly 8½ per cent.

7. Very considerable repairs have been executed in the European Hospital Wards, male and female. The matting in the roofs was all rotten, a few rafters and one ridge-pole were broken; all were renewed: the tiles and chunam plaster of the flooring in wards and verandahs had to be nearly all picked up and replaced with paving tiles and good lime. The work was roughly estimated to cost Rs. 1,900; but I anticipated a saving of at least Rs. 400 on that sum. The expenditure up to 30th April was Rs. 1,225-15-8.

8. A new cook-house, 18′ × 10′ internal dimensions, has been finished for the Serjeants' Mess H. M.'s 83rd Regiment, at an actual cost of Rs. 328-9-8, the estimate being for Rs. 348. This, as well as that built for the Female Hospital Ward, is constructed entirely of burnt-brick and lime, nine feet under beam, and the roof composed of teakwood, double-tiled, with choonam ridges and eaves.

9. Great exertions have been made in H. M.'s 83rd Regiment for the better accommodation of the married people during the present hot season and approaching monsoon. Hitherto they had been living in wattle and daub huts with a thin roof of single tiles over them, an insufficient protection against either heat or wet. Moreover their position was bad; the front row got air enough, but the three immediately behind (a kind of open column) had no air at all, except what came from the NW. angle, tainted by passing over two privies on the left flank of the barracks. Nearly one hundred sickly men, women, and children were sent away to Mount Aboo, and one barrack being thus made available, was immediately fitted up with double mat framed partitions, six feet high, with doors, and enclosing enough apartments, about 10′ × 15′ each, to accommodate twenty-seven families, giving them clear passages right through from door to door and end to end of the barrack-room, besides from the height of the party walls allowing them free use of punkhas night and day. At the same time that the new School-room was

reported finished as well as the quarters for Schoolmaster and Mistress, the old School-room was given up to the Band, and the old Orderly-room (the Office having been removed to its legitimate room under the same roof as the Serjeants' Mess) was partitioned off into three more quarters. This temporary accommodation has been afforded to thirty families at the small cost of Rs. 209.

10. In the mean time considerable progress has been made in designing and commencing permanent quarters for married European soldiers. The plan selected has of course been according to the instructions issued by the Honorable the Court of Directors, No. 187, dated 5th November 1856, which allows each family one room $14' \times 16' \times 15'$ under beam, and one verandah room $10' \times 14\frac{1}{2}'$. Six blocks, containing each quarters for fourteen families, with a front verandah ten feet broad in the clear the full length, are in course of construction, and will, I trust, be finished before the end of 1857. The foundations of five were lined out first of all, excavations of four are completed, and foundations and plinth of two are filled in and raised with burnt-brick and lime; and I hope before the end of June to have two completed if not altogether habitable. I would have had four ready by that time, but unfortunately I could not get sufficient bricklayers, though I wrote to all the surrounding towns, even as far as Kaira, but only succeeded in obtaining fifteen from Puttun, paying them 8 annas a day each, whilst Deesa men can only get 6 annas, about as much as they are worth.

11. The construction of these buildings will all be solid and substantial, that is, brick and lime superstructure, teak trusses and rafters in the roof, teak doors and windows with their frames, double-tiled roofs with choonam ridges and eaves, and bamboo battens. The site of these Patcherries is most excellent, being on the left flank of all the barrack buildings, with a clear open front facing nearly due west; and the blocks being built in echellon, each one is open to all the prevailing winds that blow.

12. In the Horse Artillery Lines great improvements have been and are being made. The Quarter Guard has been improved by a new roof to the verandah supported on teak principals, the old one

having lagged and become dangerous. At the same time the guard-room itself has had two windows added, much to the improvement of its ventilation and light, as well as to the comfort of the men. This work, estimated at Rs. 321, only cost Rs. 230.

13. The NW. verandahs of the Serjeant Major's and Quarter Master Serjeant's quarters were built up by Lieutenant Sellon, and now afford the additional accommodation of three rooms $18' \times 7' \times 7\frac{1}{2}'$, $27' \times 7' \times 7\frac{1}{2}'$, and $8' \times 7' \times 7\frac{1}{2}'$ respectively, to each quarters. The estimate for this work amounted to Rs. 970, and the actual cost was Rs. 756-15-10, being a saving of 22 per cent. Alterations of a precisely similar nature were afterwards carried out by me in the Riding Master Serjeant's quarters, which cost Rs. 355, the estimate being Rs. 400; being $11\frac{1}{4}$ per cent. saved.

14. The plunge bath has been altered by the substitution of a double-tiled roof on teak trusses and rafters in lieu of a thatch; the walls between pillars have also been built up and plastered inside with lime; wooden frames, with painted canvas stretched over them, have been fixed on hinges between the pillars and below the pole plaster for the purpose of ventilation. This has been executed at Rs. 536, the estimate amounting to Rs. 609, on which there has been a saving of 12 per cent.

15. The three cook-houses have been improved by the addition of drains and cesspools, one to each; costing in the aggregate Rs. 49.

16. The quarters for married men were finished altogether on the 29th November 1856. The last six bathing-places were finished up, according to original design, with cut-stone pavement. The building stands well to the front of the Barracks and Horse Lines; contains quarters for thirteen families, each having two rooms $14' \times 13'$ and a bathing-room in the rear verandah, seven having cut-stone and six choonam plaster floors or pavements; the verandahs at the rear ends are built up as store closets; the whole is permanently and substantially built in all details. Detached cook-houses and privies belong to each quarters separately; the cook-houses being each $10' \times 10' \times 7'$ and the privies $8' \times 6' \times 7'$, drained by cylindrical tiles

laid in lime cement into two cesspools. Estimated cost Rs. 18,963; actual cost Rs. 18,061-10-4: saving 5 per cent.

17. Considerable progress has been made in the construction of the Mess-house for Serjeants, containing also the Library and Orderly Room. All the superstructure is finished, and in fact the whole should have been complete and handed over to the Artillery, had I not been obliged at last to turn all available labour, masons and carpenters, over to the European Regiment family quarters. As it is, only slow progress is being made with the roof, all the principal parts of which are nevertheless fixed and every part ready, if I could only get more hands.

18. The Mess Room itself is 18′ × 22′ × 16′ feet under beam, with closed verandahs to front and rear. At first there were two arched doorways leading into each of the verandahs, but I obtained sanction to alter that, and now there are two large archways of eight feet span connecting main room with front and rear verandahs; another at the east side, leading into the Reading Room, of ten feet span; and on the fourth side, or NW., is a passage leading to two godowns or offices, with plank doors, window shutters, and iron bars. The Orderly Room is entirely separate from these; is eighteen feet square and sixteen feet under beam; has four glazed windows in main walls, and verandahs enclosed, having 16 half-pannelled half-glazed doors right round the building. The estimated cost was Rs. 5,883; the cost up to the 30th April Rs. 3,426-15-10.

19. Attached to the building is a cook-house precisely similar in construction and dimensions to that built for the Serjeants' Mess H. M.'s 83rd Regiment; the foundations, plinth, and superstructure are nearly finished; the roofing is ready; doors and window-frames fixed. Estimated cost Rs. 347, and Rs. 137-15-10 were expended up to April 30th.

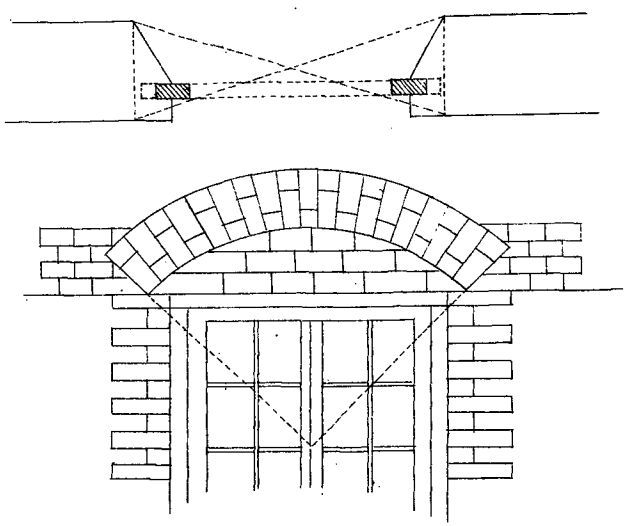
20. A pillar to support the rain gauge was erected near the Hospital, costing Rs. 2-0-6.

21. The brick floors in the Hospital were repaired at a cost of Rs. 88-5-4.

22. In the Native Infantry Lines the following new works and

repairs have been executed or commenced. A Staff Serjeants' quarters on a good site near the Quarter Guard has been commenced, the foundation and plinth finished, and superstructure raised ten feet; doors and window frames fixed; the wood-work of roof all ready; but the great want of workmen prevents the completion of this as well as of many other buildings.

23. I have deviated slightly from the plan in the superstructure of this house, not with regard to size or dimensions, but only in the detail. For instance, the doors and windows were designed with lintels but without any relieving arch over them; I have had the door and window frames fixed in the usual manner but without lintels, for which, however, I have made the following substitution. The head of the door frame projects three and a half inches on either side beyond the jambs; I have therefore built a relieving arch of 120°, having a chord equal to the frame-head plus two inches, so that in case a frame gets damaged by white ants or dry rot, the whole can be removed without destroying any of the masonry. The archway head is filled up over the frame with brick or edgework. (The diagram shows the plan and also the elevation.)



Therefore the only weight that can possibly fall on the door-frame is that of the brick or edgework, insufficient to cause the slightest deflection. In my plans for the new Patcherries of the European Regiment, I have altered this again by putting a lintel above the frame, $5\frac{1}{2}$ inches broad by $2\frac{1}{2}$ inches thick, to support the brick filling-in of the arch.

24. Extensive repairs have been carried out in the Native Infantry Hospital. The roof stripped and new bamboo battens substituted for the old rotten ones; plaster of walls, which was blistered and falling off, all renewed; floors dug and re-made with rammed earth. At a cost of Rs. 401-0-1, rough estimate being Rs. 516; showing a saving of Rs. 22 per cent.

25. In the Cavalry Lines extraordinary repairs were commenced to all buildings on account of the head-quarters of a Regiment being expected here; such as repairs to roofs, door frames and mats, saddle-rooms, white-washing, &c. The whole was estimated roughly to cost Rs. 1,200, had cost up to 30th April Rs. 219-4-5, and will probably be completed for about Rs. 289, in consequence of subsequent orders being issued only to repair as many buildings as would be required by one Squadron.

26. Some repairs of chunam plaster to walls and mat frames were executed in the Cavalry Hospital, costing Rs. 104-8-5.

27. Extensive repairs were executed to the Sick Horse-Stables. Roofs were stripped, and new bamboo battens, many rafters, and several principal rafters, were renewed; floorings remade with mud and plastered, and the walls white and colour-washed; the whole costing Rs. 615-10-4.

28. At Mount Aboo extensive repairs have been commenced to the Barracks and Hospitals. There was no doubt in the world as to their necessity, but the matter was made more urgent than requisite. The chuppers were described as half blown off and destroyed by a gale of

wind accompanied by hail, and fears were entertained as to their safety in case of another storm; yet when I examined them carefully afterwards, I could find nothing more than the ridges stripped off, and the outer coating (which I had reported rotten in November) was slightly displaced on the weather side in one barrack: the buildings were, however, perfectly safe, and I could not find a single leak. I gave the work out by contract for Rs. 2,500 to Mr. Johnstone, Rs. 1,100 of which had been spent on the 30th April. The work was being well carried out, and will be finished by the middle of June.

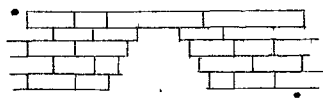
29. The repairs to the Ghaut Road had cost, up to 30th April, as follows:—

On original estimate sanctioned on the 11th February 1856.....Rs.	1,627	0	0
Emergent work executed by Lieutenant Griffith for damage done, and not included in above Estimate, but on authority of Emergent Requisition from Sir H. Lawrence, Governor General's Agent in Rajpootana	65	2	7
Work executed on authority of sanction to a Supplementary Estimate dated 17th November 1856	315	0	0
Total..Rupees	2,007	2	7

The cost will eventually be equal to the sum sanctioned.

30. The nature of the work has been—filling in with gravel and earth channels cut across and along the roadway by last rains, clearing side gutters, improving the cross section, building up a retaining wall of dry rubble to improve an ascent; some railings of stout bamboo were also thrown across one or two sharp corners, where there were drops of upwards of 100 feet. Four water-ways have been improved by building culverts of loose blocks of stone

one overlapping the other, as in the diagram. These being from three to four feet high, have served also to fill up two very abrupt dips, and thereby improve the road materially. If I could only get sanction for a Muccadum and three or four Coolies to be kept up during three months (July, August, and September), I would keep the road in excellent order and guarantee there being no call for extensive repairs next year. In fact, attention bestowed on a road in the beginning of the monsoon, will ensure the work being compact and solid enough to stand the wear and tear of the dry season; whereas repairs executed in the hot weather, when water is scarce, are kicked up and pounded into dust before they are allowed to settle, and the road is ruined for the rest of the season.



31. The wall round the Burial-ground at Mount Aboo was raised to 4½ feet high of loose rubbish, four gate-pillars erected with stone and lime plastered, and two large entrance gates put up, at a cost of Rs. 174-15-9. There was a sanction of Rs. 500 for this work, of which Lieutenant Sellon spent Rs. 238-12-6; so that a saving of Rs. 86-3-9 has been effected.

32. Furniture for the Travellers' Bungalow at Anadra has been made up as follows:—two couches, two tables, twelve chairs, three teapoys, eighteen cloth pegs, and nine shelves, of teakwood. These were all conveyed to Anadra and fixed in their proper places, at a cost of Rs. 116-5-7.

33. The plans of the roads between Pansir (near Ahmedabad) and Deesa, and Deesa and Anadra, are finished, and sections taken of all rivers, nullahs, or depressions intervening. Estimates are in course of preparation for made roads and bridges right through.

34. Revised estimates for new Barracks at Deesa have been submitted for sanction, also estimates for new Barracks and a Hospital at Mount Aboo on a different site. An estimate for the alteration of the Church at Deesa has been forwarded.

35. The following summary will show the works executed in the past, to be carried out or commenced during the present year:—

	Amount of Sanction received.	Expended in 1856-57.	To be expended in 1857-58.
	Rs. a. p.	*Rs. a. p.*	*Rs. a. p.*
Works relating to the Military Department	13,35,75 0 0	35,609 0 0	96,602 6 4
Total..	13,35,75 0 0	35,609 0 0	96,602 6 4

Buildings in the General Department have been executed as follows:—

Travellers' Bungalows	Rs.	191 0 6	
Repairs to ditto		76 3 8	
Ditto to Ghaut Road		1,277 8 6	
	Rs.	1,544 12 8	

Various repairs, annual and extraordinary, as follows, have been carried out:—

To the Military Department	Rs.	7,599 15 1	
,, General ditto		65 2 7	
,, Ecclesiastical ditto		74 12 0	
	Rs.	7,739 13 8	

36. The total expenditure in the Deesa Division has been as follows:—

	New.	Repairs.	Total.
	Rs. a. p.	*Rs. a. p.*	*Rs. a. p.*
Military Department	35,609 0 11	7,599 15 1	43,209 0 0
General ditto	191 0 6	1,353 12 2	1,544 12 8
Ecclesiastical ditto	430 12 0	74 12 0	505 8 0
Total expended in the Deesa Division .	36,230 13 5	9,028 7 3	45,259 4 8
Percentage of Establishment	....	....	34 11 4

37. Establishment on the above works has been employed, as follows, in superintendence :—

Name.	Designation.	Amount of Pay, &c.			How Employed.
		Rs.	*a.*	*p.*	
Lieutenant Sellon	Executive Engineer..	2,018	10	4	Appointed Assistant Executive Engineer Northern Province.
Lieutenant Griffith.. ..	In temporary charge Executive Engineer Office.	835	13	8	Gave over charge to Captain Curtis on the 30th August 1856.
Captain Curtis.....	Executive Engineer..	6,834	0	11	Appointed Executive Engineer Deesa Division.
Serjeant Campbell	Assistant Overseer ..	527	10	0	
Serjeant Quin	Ditto ..	981	9	0	
2nd Corporal Vanovy ..	Ditto ..	127	14	8	
Abraham Huskeljee ..	Sub-Assistant Surveyor and Builder	781	1	0	
Janardhun Wassoodew .	Ditto ..	720	0	0	
Nuggurdas Brizbhookundas	Ditto ..	740	5	8	Joined at Deesa, 5th June 1856.
Ranchordas Jewandas..	2nd Class Ditto ..	469	9	10	Ditto, 6th June 1856.
Permanent Office Establishment	.....	1,667	12	11	
		15,710	8	0	

38. The following changes in the Establishment have taken place since 1st May 1856 :—

Serjeant Campbell was removed from the Department in Government letter No. 3392, dated 6th December 1856 : he has since died, off Surat, on his way down to Bombay. Head Mason Maistree Toolseeram was dismissed the Service by Resolution of Government dated 29th November 1856, which further disqualified him, or any of his family, for Government employ in any capacity. 2nd Corporal and Assistant Overseer Moritz Vanovy joined the Department at Deesa on the 11th April 1857 ; and Head Mason Maistree Sehwuck Ram joined from Surat on the 28th April. In the Office, 2nd Clerk Gunnesh Bhaskur was suspended on the 17th February 1857 for general inefficiency and carelessness, the same being confirmed by the Assistant to Chief Engineer's letter No. 2018, of the 13th April, paras. 2 and 3, and the 2nd Clerk was discharged.

39. The distribution for the Establishment for the year 1857-58 is arranged as below mentioned :—

Deesa and Ahmedabad Road.

Assistant Surveyor and Builder Abraham Huskuljee.

Assistant Surveyor and Builder Janardhun Wassoodew.

Aboo Road.

Assistant Surveyor and Builder Runchordas.

Aboo Ghaut Road.

Assistant Overseer 2nd Corporal M. Vanovy.

Works at Aboo.

Assistant Overseer 2nd Corporal M. Vanovy and Nuggurdas Brizbhookundas.

Works at Deesa.

Assistant Overseer Serjeant Quin.

Office duty.

Abraham and Janardhun by turns.

I have the honour to be, Sir,
Your most obedient Servant,
A. H. Curtis, Captain,
Executive Engineer, Deesa Division.

Executive Engineer's Office,
Camp near Deesa, 25th May 1857.

No. 4801 of 1857.

Public Works Department.

Office of Chief Engineer of Public Works,
Bombay, 7th September 1857.

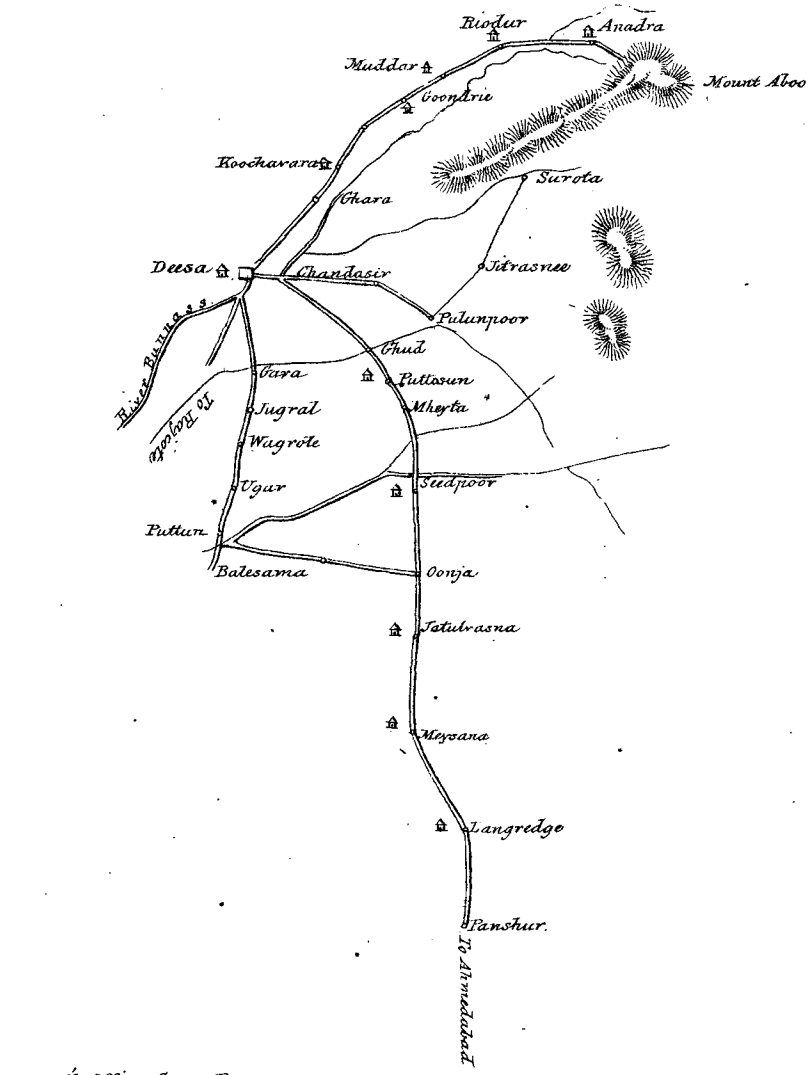
To the Right Honorable Lord Elphinstone, G.C.H.,
Governor and President in Council.

My Lord,—I have the honour, in compliance with the instructions in the 5th paragraph of the Government Resolution under Mr. Secretary Hart's Memo. No. 1806, of the 27th November 1855, to

SKETCH MAP
Showing the extent of the Districts
in charge of the
EXECUTIVE ENGINEER, DEESA. DIV.

Scale of Miles.

20 10 0 20 40 60



Ex. Engrs Office. Camp. Deesa.
17 June 1857.

(Signed) A. H Curtis, Captain,
Ex. Engineer, Deesa

Drawn on Transfer by R. Rozario.

B.E.S. Press.

submit a report by Captain Curtis, Executive Engineer Deesa Division, of the operations of his Department during the year 1856-57, No. 56, of 25th May 1857, with a Sketch of his District. I returned this report to Colonel Goodfellow with an inquiry whether he wished to offer any remarks upon it. Colonel Goodfellow in reply sent me some general observations, which I submitted with my letter No. 4659, of the 31st August 1857, accompanied by a report from Captain Scott, lately Executive Engineer Ahmedabad and Kaira Collectorates.

2. Captain Curtis's report is drawn up with care, and he has entered into full detail of all the works in the Military Department which have been executed by him during the past year. To this class of works indeed the operations in his Department have been principally confined, the only other works executed being improvements to the Ghaut Road at Mount Aboo, a wall round the Burial-ground at that Station, and supply of furniture to a Travellers' Bungalow. The total expenditure incurred by him during the year is stated to be Rs. 45,259, and the cost of superintending establishment nearly 35 per cent. on the expenditure.

3. Captain Curtis appears to have been introducing daily payments of work-people, and abolishing muster rolls, altering the hours of labour, and himself looking closely into the Office books and overseeing the work. He records with satisfaction, in his 4th paragraph, that he has " many bricklayers (inhabitants of Puttun) who can run up fifty feet of solid brick and lime, good masonry, well bounded and jointed throughout, in one day ; whereas formerly from twenty to twenty-four cubic feet was an average day's work."

4. Daily payments have the advantage of simplicity, and, when the work is under the eye of the Executive Engineer, are not so objectionable. When this is not the case, they have the insuperable disadvantage that it is impossible to contrive any effectual check on the accuracy of the payments. To make daily instead of monthly payments, is, moreover a step backward in civilization, and Captain Curtis's successor will find himself probably unable to retrace that step, should he wish to do so and return to what is certainly the preferable method, that of monthly payments.

5. Captain Curtis reports the School-house, with Master's and Mistress's quarters, of the European Infantry Regiment at Deesa, completed, excepting the necessaries, on 30th April last (para. 5); also a kitchin for the Women's Hospital (para. 6). The whole Regimental Hospital was thoroughly repaired, and a cookroom had been built for the Serjeants' Mess (paras. 7 and 8).

6. In paras. 9, 10, and 11 of his report, Captain Curtis describes the measures adopted by him to give temporary accommodation to the families of Her Majesty's 83rd Regiment, and the progress made by him in the construction of permanent married men's barracks on the scale prescribed by the Honorable Court (No. 187, of 5th November 1856), and the immediate construction of which was sanctioned by Government Resolution under No. 558, of the 25th February. Plans and estimates for these buildings have been called for, and, when furnished, the estimate of Rs. 1,05,201, entered as No. 45 in Statement 1 of the Budget for 1857-58, will be superseded by the fresh estimate.

Accompaniment to Mr. Secretary Hart's Memo. No. 341, of 3rd February 1857.

7. Improvements have been made to the quarters of the Serjeant Major, Quarter Master Serjeant, and Riding Master of the Troop of Horse Artillery at Deesa, and to the Troop Quarter Guard (paras. 12 and 13). A tiled roof has been substituted for a thatched roof over the Artillery plunge bath, and the spaces between the pillars of the bath-room closed. Cesspools and drains have been constructed to the three cookrooms of the Troop (paras. 13 and 14).

8. But the principal addition to the Horse Artillery building at Deesa, completed in 1856-57, has been that of the quarters for thirteen married men, each consisting of two good rooms, with a bathing-room in the rear verandah, and a detached cookroom and privy. It is impossible not to be gratified with the description of the comfortable and nicely finished quarters which Captain Curtis describes in his 15th paragraph, and which he states that he has completed with a saving of 5 per cent. on the estimate (para. 16). But I confess that I am as much alarmed as gratified when I look at the costly nature of the

accommodation now thought necessary for an European of the humblest rank. These quarters have cost Rs. 18,062, or Rs. 1,389 for each family; and I have lately had occasion to notice that an estimate for married men's quarters at Ras Tarshayn, Aden, and not of the most durable kind, has nearly reached the sum of Rs. 2,000 for each married man. If the private Soldier is to have such quarters as these, the next question is what description of quarters will Staff Serjeants, Warrant Officers, Apothecaries, and all those for whom quarters are provided by the State, have a right to demand. Certainly we cannot expect them to be satisfied with the accommodation hitherto prepared for them, and which nevertheless is very commonly quite as good as that which a Subaltern Commissioned Officer thinks, or used to think, sufficient.

9. The former system under which a married Soldier was expected to hut himself, receiving a sum of 20 Rupees on each change of quarters, was certainly objectionable. The sum was quite insufficient, even with assistance from the Regimental funds, and the Patcherries thus erected were not such quarters as an European should have for himself and family in this country. At the same time, I cannot but think that we have now run into the other extreme, and that the accommodation, even as now restricted by the Honorable Court, will be found to involve a most serious expenditure both in first erecting and then maintaining such costly structures.

Jameson's Code, page 139, para. 99.

10. My objections are not limited to the accommodation for married men. I consider, and have more than once expressed my opinion, that the whole system of accommodation as recently introduced, is far beyond what is necessary or even conducive to the comfort and health of the men. Rooms 30 feet high (the minimum allowed by the late General Sir C. Napier) are neither necessary nor desirable in my opinion, and upper-roomed barracks cannot, I think, be required, except perhaps in low flat countries, such as Guzerat. I have never been able to see their advantage, and I believe them to be disliked by the men. These are a few only of the lately introduced

changes (not always improvements according to my views), and the augmentation of expense involved in them is enormous. I speak within bounds when I say that the cost of accommodating an European Regiment has been much more than doubled in the course of a few years and within my own experience. Whether the comfort and health of the Soldier have improved at all in proportion I have not the means of knowing.

11. The Mess-house for the Horse Artillery Serjeants, with Library and Orderly-room under the same roof, was, it appears, very nearly ready at the close of the official year (paras. 17, 18, and 19); but had been delayed by the necessity of putting all hands on the family quarters of Her Majesty's 83rd Regiment.

12. A Staff Serjeants' house in the Native Infantry lines was in progress. The Native Infantry hospital had been thoroughly restored, and some extensive repairs made in the Cavalry lines (paras. 22 to 30).

13. At Mount Aboo the enclosure wall round the Burial-ground had been completed, with a saving of Rs. 86 on the reduced estimate of Rs. 500. The cost of this work was originally estimated by Lieutenant Sellon at the excessive sum of Rs. 780. The Travellers' Bungalow at Anadra, at the foot of the ascent to Mount Aboo, has been furnished and fitted at a cost of Rs. 116 (paras. 31 and 32). The Ghaut road has been thoroughly repaired at a cost of Rs. 1,278.

14. An estimate with plans and sections is, it appears, under preparation for a road from Ahmedabad to Deesa and thence to Anadra (para. 33). The revised estimates for Barracks at Deesa, alluded to in the 34th paragraph, have been directed by Government Resolution under No. 2080, of the 20th July, to be included in the Review Statement for next Budget. The cost of erecting Barracks and Hospital at a new site on Mount Aboo was reported in my letter No. 3734, of the 16th July 1857. The estimate for alterations to the Church at Deesa has been returned for revision, in accordance with certain suggestions by the Lord Bishop.

15. Captain Curtis has on his establishment Serjeant Assistant Overseer Quin, Corporal Assistant Overseer Vanovy, Sub-Assistant

Surveyors and Builders Abraham Huskeljee, Janardhun Wassoodew, and Nuggurdas Brizbookundas, and 2nd Class Sub-Assistant Surveyor and Builder Runchordas Jewandas. Captain Curtis makes no remarks on the conduct of any of these subordinates.

I have the honour to be,
My Lord,
Your Lordship's most obedient Servant,

C. WADDINGTON, Major General,
Chief Engineer of Public Works.

MINUTE OF GOVERNMENT,

RECORDED 5TH DECEMBER 1857.

The following is a Summary of the observations made by the Governor in Council, on a perusal of the fifteen Reports of the Executive Engineers of the Southern, Central, and Northern Provinces, for the year 1856-57, submitted by the Chief Engineer of Public Works, between the 20th July and 15th October 1857 :—

DHARWAR.

(Pages 1 to 9.)

2. The Dharwar Executive Charge has been, during the past year, subject to a change of incumbency, owing to Lieutenant Playfair's services being required for Military duty in Persia; and there has been nothing of peculiar interest reported regarding it.

3. For the restoration and material conservancy of the numerous Tanks in this Collectorate, Government have been anxious to introduce a class of Subordinates specially trained for such work, and are gratified to observe that the measures adopted with this view are likely to be successful.*

4. Government consider that Lieutenant Close is quite right in his opinion† that Tanks and Wells used solely for the personal convenience of the Ryots, should, as a general rule, be kept in order at their expense; though, of course, exceptions to this rule must occasionally be admitted.

5. With reference to the observations‡ in Lieutenant Close's 15th and 16th paragraphs, Government have generally required, as a condition of assisting Ryots in providing works to which they promise to contribute, that the contributions of the people should be either paid

* Pages 4 and 8. † Pages 3 and 8. ‡ Page 3.

or secured before any actual expenditure of Government money was made, and this, as a general rule, appears sufficiently stringent.

6. The Governor in Council is gratified to observe the terms in which Lieutenant Close speaks* of his Sub-Assistant, Mr. Pemberton, and of Serjeants Mungavin, Fawcett, and Coulter. The last named of these Subordinates has been lately relieved of duty in the Public Works Department, but is indebted in a great measure to this Report for the mode in which he has been remanded to his Corps.

7. His Lordship in Council observes also, with much gratification, the general remark recorded in the last paragraph† of Major General Waddington's letter No. 4180, dated 10th August 1857.

BELGAUM.

(Pages 10 to 27.)

8. The Belgaum Executive District is also one which has suffered from change of incumbency during the past year; Captain Houghton, whose Report is now before Government, having been in charge of it during only a portion of the year.

9. When the scheme for the reorganization of the Public Works Department, now under the consideration of the Government of India, is sanctioned, the limits of this Charge will be extended towards the North, and curtailed on the East; and it is hoped that sufficient scientific Engineering assistance will be available to do justice to the District, which is an important one, and capable of much improvement.

10. The Subordinate and Office Establishments of the Executive Engineer of Belgaum seem to require a more strict superintendence than they have hitherto received.

11. Had Government been aware that Captain Houghton's appointment as Executive Engineer of Belgaum would have occasioned the pecuniary loss described in his 39th paragraph,‡ it would not have been made; as he was, no doubt, more usefully employed when in charge of the works on the Wurrunda Ghaut as an Assistant to Captain Kennedy, than at the head of the Executive Engineer's

* Pages 4 and 5. † Page 8. ‡ Page 20.

Office in Belgaum. Captain Houghton's recall to his Regiment renders unnecessary any measure in correction of this matter.

RUTNAGHERRY.

(Pages 28 to 37.)

12. There is not much to notice in the Report submitted respecting this Executive Charge; but with respect to the remarks made by Major General Waddington in para. 5* of his letter No. 4108, dated 4th August 1857, Government observe that their previous Resolution No. 3342, dated 3rd December 1856, when the condition of the Dajeepoor Travellers' Bungalow was under consideration, contained the following passage:—

"From the correspondence now submitted, Government gather "that the dilapidated condition of the Bungalow is mainly attri- "butable to the total neglect of the Public Works Officers to do "anything towards keeping it in order. This neglect appears to "have resulted from the omission of the Military Board to direct "that the Bungalow should be taken charge of by the Executive "Officer of the District, when purchased by Government under "Resolution No. 305, dated 24th January 1855."

KOLAPOOR.

(Pages 38 to 44.)

13. Government do not consider that this Report calls for comment from them. Under the scheme for reorganizing the Public Works Department of this Presidency, the Kolapoor Executive Charge, which is not of sufficient importance to remain a separate one, will be annexed to that of Belgaum.

SHOLAPOOR.

(Pages 45 to 59.)

14. Captain Adams' Report of the operations of his Department in 1856-57, illustrated by the accompanying Tabular Statement, are sufficiently explicit. They do not seem to require at present further

* Page 37.

remarks than those recorded by the Chief Engineer's Memorandum No. 4859,* dated 10th September 1857.

15. The following is a copy of the Government Resolution No. 1909, dated 11th December 1855, referred to in para. 4 of that Memorandum:—

"Considering that the Railway will touch Mohol, Government "consider the outlay required for bridging a Nullah there, at such "a large expenditure as Rupees 15,000, a matter of very question- "able economy.

"Government presume that this Nullah is the same as the one "which formed the subject of the Chief Engineer's letter No. 4597, "dated 9th May 1855; but the prospects of the Railway have be- "come much more definite since then, and before sanctioning such "an expensive work on a road already open for cart traffic, but "which the Railway will probably almost altogether supersede, the "Governor in Council thinks it necessary to require more precise "information as to the necessity of the work now submitted for "sanction."

16. The explanation required by this Resolution has not yet been afforded.

SATTARA.

(Pages 60 to 90.)

17. In reviewing the Sattara Report for 1856-57, Government observe that it was the first of that year's series submitted to them by the Chief Engineer, who, in his letter No. 3803, dated 20th July 1857,† has reviewed it at greater length than any of the others laid by him before Government.

18. While admitting the highly satisfactory nature of Captain Kennedy's Report, and doing full justice to his intelligence, activity, zeal, and success as an Executive Officer, the Chief Engineer observes‡ that his appreciation of this very meritorious Officer's practical qualifications and active proceedings, does not extend in all cases to his opinions, some of which Major General Waddington thinks "crude

* Pages 56 to 59. † Pages 84 to 90. ‡ Page 85.

and ill-considered." The Governor in Council will, in the first place, notice the points on which the Chief Engineer expresses a difference of opinion from Captain Kennedy.

19. These points are—

1*st*.—The difficulty of procuring Masons, which is described and discussed in the Executive Engineer's 102nd to 111th paragraphs.*

2*ndly*.—The increase of upper and subordinate Engineering agency, advocated in Captain Kennedy's 98th and 99th paragraphs,† and also, under the head of "Projected Works," in para. 92‡ of his Report.

3*rdly*.—The appointment of "Office Assistants," or other means for improving the prospects, and consequently the efficiency, of the Executive Engineer's Office Establishment, employed as Clerks and Accountants, urged in Captain Kennedy's 113th and two following paragraphs;§ and

4*thly*.—The institution of a Central Depôt for the supply of "Plant," recommended in his 115th to 119th paragraphs.‖

In no other matters does the Chief Engineer seem to object to any of Captain Kennedy's remarks or opinions.

20. The first of these points is noticed in para. 14¶ of Major General Waddington's Report of 20th July, in which he points out that no part of the difficulty of obtaining Masons ought to proceed from inability to give the fair market rate of wages for their labour; which, he says, the Executive Engineer is authorised, on certain conditions, to do, whatever may be the rate on which his Estimate has been based. This will of course remove the practical difficulty. But this alone is not enough; for, without an authoritative revision of rates, the Executive Engineer is still left in the unfair position of being obliged to prepare Estimates on rates which he knows to be incorrect; Government, who accept the rates of the Estimate as correct, are, when called on to sanction the work, deceived as to its probable cost; and, finally, the Executive Officer comes to be, as it were, placed on his defence for exceeding his Estimate, which he would not have done had he

* Pages 77 to 79. † Pages 76 and 77. ‡ Page 75.
§ Page 80. ‖ Pages 80 and 81. ¶ Page 89.

been permitted to frame it according to actual existing prices. When there is a continued tendency in rates either to rise or fall, those which are taken as the bases of Estimates ought to be from time to time revised. This is a matter which has repeatedly been noticed by Government.

21. Captain Kennedy's suggestions with regard to the second and third points enumerated above in para. 19, are combated in the Chief Engineer's 13th and 15th paragraphs.* Major General Waddington is aware that, whether or not Captain Kennedy's opinions on these points are "crude and ill-considered," they are those already adopted by Government, who are unable to recognize, in what is now urged against them by the Chief Engineer, sufficient reason for their abandonment.

22. As to the second point, Government observe, that in his letter to the Chief Engineer of Public Works No. 1456, dated 31st December 1856, Captain Kennedy stated that he believed, that owing to savings effected in the construction of the Koombarlee Ghaut Road, he was in a position, if permitted, to add a kerbing to that road, without calling on Government to sanction any increase on the Estimate on which he was working; which, it is to be remembered, was one very greatly reduced from the Estimate prepared by his predecessor.

23. Captain Kennedy was accordingly permitted by Government to make the proposed addition, provided he could do so without exceeding his reduced Estimate, and was at the same time called on to explain, in some detail, the nature of the savings to which he referred; the Government Resolution by which this permission was accorded (No. 415, dated 10th February 1857) concluding as follows:—

"Captain Kennedy should be informed that the object of Go-
"vernment, in making these particular inquiries, is to obtain facts
"illustrative of the question as to how far, as a general rule, a
"liberal allowance of Superintending Officers of a superior and
"more expensive grade (as Assistant Executive Engineers) can be

* Pages 88 and 89.

" regarded as economical or otherwise in carrying out works, by " enabling an Executive Engineer to obtain more or better work " than, without being assured of such assistance, he could venture " to anticipate according to the standard rates on which he is " justified in framing his Estimates."

24. In his reply to the above, No. 450, dated 28th March 1857, Captain Kennedy wrote as follows:—

" 7. In regard to para. 2 of Government Resolution above " quoted, the advantages of a proper proportion of educated scien- " tific superintendence are manifold and manifest, though at the " same time it is most difficult, by direct facts, to prove to demon- " stration what, on the one hand, would have been saved by a " sufficiency of this class of assistance, or, on the other, what would " have been lost by a deficiency. In the case in point, I do not " consider that I have ever had sufficient of this style of superin- " tendence to enable me to get all out of the work, that might have " been done had I had more at my disposal; though what I have " had, has, I am happy to say, put me in a position to do a large " mass of work in at least a respectable style.

" 8. When the work recommenced last year, I had only one " Assistant to place on it; and—considering its extent, the number " of points requiring attention, the amount of new lining out to be " done, the mass of working drawings to prepare, the inexperience " of the subordinate assistance, " and other points of difficulty, " which may be judged of by the " memorandum of work in the " margin, showing what was got " through—this was, without a " doubt, quite insufficient. For- " tunately this Assistant, Lieu- " tenant Merriman, though him- " self without experience in works " of this nature, was a most ener- " getic and able Officer; but still, to make up for our numerical

Thirty-three and a half miles of Road laid out, and brought to formation level, including Embankments to Bridges and Drains.

Five miles of Ghaut Road opened out, the greater part in solid rock-cutting.

One hundred and twenty-five Road-Bridges and Drains built.

Foundation of the Keera Bridge at Patun, of three arches of sixty feet span each, laid, and Abutments and Piers brought up to springing level.

One Abutment and one Pier of the Bridge over the Quoina at Helwak, of five arches of sixty feet span each, founded, and partly brought up.

"weakness, we had to undergo labour, of which not all Officers, "no matter what their zeal or ability in other respects might be, "would be physically capable.

"9. With a working Establishment numbering, all included, at "one time, not far under 10,000 souls; with new Bridges and "Drains and Works scattered over a line of nearly fifty miles in "extent; new Road Sections to line out; Gradients to lay down; "Embankments, Cuttings, and Curves to peg out; and all the "details of an undertaking which at Home would have claimed the "attention of at least half a dozen professional Engineers;—with, "at the same time, all the interior details of accounts, supply of "materials, and organization of labour, which in England are a "Contractor's province only; and without plant, or reliable inferior "superintendence,—it must be apparent that one resident scientific "Officer (for I myself had other important calls upon me demanding "my frequent absence) is the very minimum with which the "thing could be done at all; and though both Lieutenant Merri- "man and myself laboured to make up, as far as possible, as before "stated, for numerical weakness, by habitual six to eight hours' "(and often much more) work, daily, in the field, in addition to "the never-ceasing, never-relaxing desk and office work; it was a "source of constant conversation between, and regret to us, that "in many points, and in various ways, we saw that improvements "and savings might be made, were more perfect superintendence of "a higher class available.

"10. The experience of the present year's operations, though I "have again been fortunate in having had the benefit of the assistance "of an able and indefatigable Officer, Mr. J. Hart, C. E., tells the "same story, though not, owing to the work being of a more com- "pact and settled nature, to the same extent; and I have no "hesitation in affirming that, had I had, or had I now, two or three "more educated Assistants at my disposal, I could save at least the "amount they would receive as pay, and *do the work better*. I "cannot prove this, because it is a style of proposition that does "not admit of exact demonstration; but I believe it sincerely and

" honestly, and must therefore leave Government to place as much " or as little reliance on the assertion, the result of my experience, " as they may consider it to deserve.

" 11. It may, however, reasonably be expected of me, that I " should at least indicate in what manner the advantages of superior " assistance operate, and this I can easily do.

" 12. An educated Engineer knows how to avail himself of all " advantages of soil and feature, and, in the simple arrangement of " details, is enabled to effect savings to a large amount. He can " save money, for instance, by stepping the wing walls of a Bridge " *up* a bank instead of sinking them *into* it, as most Overseers, and " nearly all Maistries, would do; and as there are few cases in " which all four wings of any given Bridge may not advantageously " be made to differ in length and mean height, according to the " slopes and soil of the nullah banks up which they are built, on " this item alone much can be either saved or uselessly expended. " No average plan can be made to provide for the ever-varying " circumstances of cases like these; each must be decided on and " settled as it arises, both as to length, height, and splay, to fit the " nullah and ground on which the Bridge or Drain is constructed. " An educated Engineer knows where he may safely found his work, " and, while carrying down his excavation to a reliable stratum, he " will be able to judge when to stop, and will not, for the sake of " extra and unnecessary security, involve himself in an amount of " work which is not positively requisite. He will take care in his " Road-work to calculate his cuttings so, that, as far as possible, they " may balance his embankments; and will manage his details so, as " to avail himself, to the utmost, of all favorable features. On Ghaut- " works, the height of his section in rock, the nature of the rock " itself in reference to the ease or difficulty with which it yields to " the mining-bar, and its fitness for building purposes, will enable " him to determine on the advisability of less or more retaining " wall; and in this matter also, which requires no inconsiderable " amount of a kind of judgment which few subordinates possess, is " a most fruitful source of saving or expense. An educated Officer,

"a Gentleman, exerts an influence over all under him, which an "inferior subordinate can seldom possess; and his orders and direc- "tions are more likely to meet with the strict attention which the "good of the work requires. Such an Officer is able to take in and "comprehend the whole scope and bearing of what is before him, "and is thus better able to make all work to one end: he is able "on the numerous emergencies which must arise, and which no "plans, estimates, or previous instructions can provide for, to act "with judgment and promptitude; and, finally, there is hardly a "point, no matter how minute, in a varied work of this description, "on which a professionally educated Engineer, and a man of judg- "ment and resource, cannot make his presence beneficially felt, and "on which his eye is not wanted. This is more especially the case "in this country, where, without the usual means and mechanical "appliances, so much has to be done by 'make shifts.'

"13. All this is so very obvious, that it may be a work of "supererogation to allude to it at all. In Engineering, as in every- "thing else, the more perfect the tools the better the work turned "out; and the only point really requiring discussion, is the limit "to be assigned to the employment of agency such as that referred "to. This is, however, not so easily determined; it is a practical "question, which varies according to circumstances and the nature "of the work involved. In the case of the Koombarlee Ghaut "Line, though I have certainly had enough of the higher class of "assistance to enable me to do a very large amount of work, in, I "think, a creditable manner, and to effect large savings, I still feel "that I could have done better, had I had more of this kind of help."

25. In his Memorandum No. 2375, dated 2nd May 1857, with which the letter last quoted was laid before the Governor in Council, the Chief Engineer, after quoting the Resolution described above in para. 23, wrote thus:—

"3. Captain Kennedy has done his best to support the views "of Government thus clearly laid down on the subject submitted to "him, and has written an able Report; but he has so far failed, it "seems to me, in his purpose, as to be unable to bring forward any

" facts showing the extent to which advantage may arise from the " employment of a liberal allowance of a superior and more expen- " sive grade of superintendence."

26. When thus recognizing the opinion upheld by Captain Kennedy as one adopted by Government, the Chief Engineer forebore to designate it as "crude and ill-considered," but at the same time he combated it on the grounds which he consistently urges in the letter now before Government; explaining, further, his opinion, that such assistance not being charged to works, the Executive Engineer who enjoys it is placed in an unfairly advantageous position, as work executed by means of it appears to cost less than it really does.

27. But the Governor in Council does not perceive that, at any rate in extensive works, such as the Koombarlee Ghaut Road, there could be any difficulty, or other objection opposed, to charging the salaries of Assistants, such as those indicated by Captain Kennedy as desirable, to the works on which they are employed; and, with the understanding that this can be done, he sees no reason for altering his opinion, which agrees with that of Captain Kennedy, as to the advantage of Executive Engineers being furnished with as much professional assistance of a superior order, as they know they can advantageously employ.

28. With respect to the third subject enumerated above in para. 19; that of Office Assistants, this also is one in which Government have already communicated to Major General Waddington (in their letter No. 2902, dated 25th October 1856) an opinion much in concordance with that condemned as Captain Kennedy's in para. 15* of the Chief Engineer's letter.

29. The fourth point described in para. 19, is one on which Government had not, before the submission of Captain Kennedy's Report now under consideration, received any suggestions. Lieutenant Colonel Kilner, who notices it† in his letter handing on Captain Kennedy's, appears to be in favour of the Depôt of Plant suggested; but neither he, nor Captain Kennedy, has proposed any definite means of carrying out the suggestion, to which the difficulties noticed

* Page 89. † Page 83.

by Major General Waddington no doubt apply. It is possible, however, that these might be overcome, and Government will be glad if Captain Kennedy will, after considering the Chief Engineer's objections, devise the details of a plan by which his suggestions may be practically carried out.

30. With the exception of the above few points, Government believe that they and the Chief Engineer are entirely agreed on the subject of Captain Kennedy's Report. His proceedings have been eminently satisfactory; and the Governor in Council notices with pleasure the terms in which he has been able to mention* the exertions of most of his Assistants and subordinate Establishment, especially Mr. J. Hart, C. E., and Lieutenant Sellon, among the former class, and Messrs. Stapleton and Brock, with Serjeants Wallinger and Wholohan among the latter: Lieutenant Merriman is not mentioned in the Report under review, but he also has been highly spoken of by Captain Kennedy, in the letter quoted above in the 24th paragraph.

31. Before closing his review of the Sattara Report, His Lordship in Council desires to add the following remarks on some particular subjects noticed by Captain Kennedy.

32. In his 89th and 90th paragraphs† the Executive Engineer suggests the execution of separate small Irrigational Works, which might be easily designed and soon effective. This suggestion is in accordance with the desire of Government, expressed some years ago in a circular letter calling on Officers to note the best positions in their Districts for the erection of such works, the only result of which was a suggestion for damming a small Nullah in the Sub-Collectorate of Colaba. Government will, therefore, be quite ready to sanction such works as those contemplated by Captain Kennedy.

33. A provision for agency, such as that proposed in Captain Kennedy's 92nd paragraph,‡ has been contemplated in preparing the revised scheme of Engineering Establishment for this Presidency, now under the consideration of the Government of India; and, indeed, that scheme, if approved and fully carried out, will place at Captain Kennedy's disposal a sufficient scientific agency to admit of his

* Pages 64, 66, and 68. † Page 75. ‡ Page 75.

Charge being extended so as to comprise the Ports to which the roads down the Koombarlee and Wurrunda Ghauts lead, and that portion of the Konkun which lies between them.

POONA COLLECTORATE.

(Pages 91 to 103.)

34. The Acting Executive Engineer in charge of the Poona Collectorate has not furnished such a Report of operations carried on in it as was desired by Government; his Report being rather a recapitulation of the manner in which he himself has been employed, before as well as since he has been in charge of this District.

35. His first five paragraphs* refer to a project which has no relation to the Poona District, and his design for which was condemned, as was also his design for carrying out the project referred to in his 6th paragraph.† Government are, however, in hopes that the information afforded by Mr. Gerrard's surveys for both these projects will be found useful.

36. Mr. Gerrard's Report, so far as it regards the Poona Collectorate, refers only to operations later than the 1st November 1856. It is deficient in arrangement, as well as in interest, and probably does not do justice to the exertions really made by Mr. Gerrard.

37. The omission of all notice of the exertions and merits of his Subordinates is remarked with regret.

38. The Report first prepared by Mr. Gerrard was returned by Government as he had evidently misunderstood the object of such Reports, which was then again explained to him. The Governor in Council, therefore, has not considered it of any use to return this Report to Mr. Gerrard for revision.

POONA AND KIRKEE CANTONMENTS.

(Pages 104 to 107.)

39. With respect to Captain Graham's Report of what has been done in the Poona and Kirkee Cantonments, the Governor in Council is not aware of much that can be added to the remarks contained in

* Pages 91 and 92. † Page 92.

the 2nd paragraph* of Major General Waddington's letter with which it is submitted.

40. Captain Graham has already been informed† that Government insist on the Contract system referred to by him in this Report as "Major Crawford's" (but which is in reality one introduced by this Government, in conformity with the wishes of the Honorable Court of Directors, and with the assent of the Government of India) being given a fair trial; and as regards the Contractors especially mentioned by him, Government have placed them in a condition to recover all that they may have lost in consequence of the enhancement of prices which has lately taken place, by promising to them the restoration of the deposits previously forfeited by them, provided they bring to a satisfactory completion the works which they have now undertaken on terms more favourable to themselves than those of the contracts which they were unable to fulfil.

TANNA.

(Pages 108 to 171.)

41. One of the most remarkable features in the Report of operations in the Tanna District, is the large proportion of the works mentioned which have required Supplementary Estimates, or been attended with excess of expenditure over estimated cost. It has already been intimated to the Executive Engineer that he has suffered in the estimation of Government, and will suffer in position, from the want of prevision in his Estimates, and of efficient control over his Subordinates, Maistries, &c., which has been evident on his part, and to which, as well as to enhanced prieces, several of the cases of excess brought to notice are attributable. This is the more to be regretted, as Government perceive, that in Surveys and such duties as depend on Lieutenant Fuller's personal exertions, as apart from duties of control and supervision, he is both zealous and intelligent.

42. The Governor in Council hopes that the Chief Engineer will lose no opportunity of impressing, upon the whole Staff of his Department, the importance of the principle of which the Government of

* Pages 107. † Government Resolution No. 2503, dated 2nd Sept. 1857.

India, in their Circular No. 4957, dated 25th September, desired that Officers generally, and Executive Engineers in particular, should be reminded; namely, that "the activity and attention to duty of their "Assistants and Subordinates will generally be found proportioned to "*their own systematic vigilance.*"

43. Lieutenant Browne and Mr. Robins appear* to have afforded considerable assistance to the Executive Engineer, and Government anticipate that, with longer experience, they will prove valuable Officers in the Department of Public Works. Lieutenant Fuller's Report† of Serjeant Cheetham's efficiency is gratifying.

NASSIK AND PEINT.

(Pages 174 to 188.)

44. The Governor in Council is well satisfied with Lieutenant Finch's Report of the operations of his Department in 1856-57. The merits of this young Officer have already attracted the attention of Government, and led to his being appointed to act in a grade unusually high for an Officer of his standing, and to his being now entrusted with an extensive Charge, that of the combined Districts of Ahmednuggur and Nassik.

45. With reference to paras. 4 and 5 of the Chief Engineer's Report,‡ Government have already informed him that they wish the Poona and Nassik Road to be regarded as a distinct work, and not as part of the series of roads which used formerly to be referred to in the Budget Statements, &c. as the "Hurryhur and Bulsar Trunk Road." The Poona and Nassik Road will be a very important junction road between the South-Eastern and North-Eastern extensions of the Great Indian Peninsula Railway, as the Nassik and Bulsar Road will be, Government hope, between the latter line and the Bombay, Baroda, and Central India Railway; both of these roads being, besides, important local lines of communication.

46. The construction of the Suttee Ghaut Road appears to have been carried forward in a very creditable manner. Government suppose, that in referring to this as a new work, all completed in six

* Pages 143 and 145. † Page 146. ‡ Page 186.

months,* Lieutenant Finch does so without reference to the old track formerly cleared by Captain Mungavin; the Ghaut opened for cart traffic by Lieutenant Finch appearing to be that laid out by Colonel Scott in March 1856. The progress made on the Nassik and Bulsar Line generally, is greater† than might have been expected.

47. Government entirely agree with the Chief Engineer in the observations‡ contained in the 7th paragraph of his Report.

48. With reference to Lieutenant Finch's 30th§ and the Chief Engineer's 8th paragraph,‖ Government are glad to learn that Mr. Latimer has been found of so much use, and regret that his declining to qualify himself for the appointment of Assistant Engineer will occasion the loss of his services to the Department. What has been represented by Lieutenant Finch¶ in favour of Mr. Parker and Serjeant Williams, will not be lost sight of.

AHMEDNUGGUR.

(Pages 190 to 207.)

49. In preparing this Report, Captain Scott laboured under the disadvantage pointed to in his 2nd paragraph,** of having been but a few days in charge of the District to which it relates.

50. It was probably owing to this, that he does not seem to have been aware that the excellent progress of the Road-works between the Imampoor Ghaut and Toka, noticed in his 12th and following paragraphs,†† and in para. 2 of Major General Waddington's letter‡‡ No. 4139, dated 7th August 1857, was mainly due to the energy and good management of Lieutenant Sprot, of H. M. 83rd Regiment, who was able, with the permission of Government,§§ to spend upon it, in 1856-57; fifteen thousand Rupees more than had been provided for it in the Budget of that year.

51. The Chief Engineer justly remarks, in para. 3 of his letter,‖‖ that the failures noticed in it, and in para. 20 of Captain Scott's

* Pages 180 and 181. † Page 177. ‡ Page 187.
§ Page 182. ‖ Page 187. ¶ Pages 183 and 184.
** Page 190. †† Page 192. ‡‡ Page 203.
§§ Govt. Resolution No. 956, dated 4th April 1857. ‖‖ Page 204.

Report,* afford an unpleasant contrast to the successful execution of the road mentioned above, and of the Imampoor Ghaut, for his efficient superintendence of which great credit is due to the Overseer, Serjeant O'Connell.

52. Government observe that in forwarding Captain (then Lieutenant) Mungavin's designs for Drains on the Ahmednuggur Road, the Superintending Engineer, in his letter to the Chief Engineer, No. 5243, dated 23rd October 1855, pointed out several objections to them, and stated that he could not recommend them for sanction. As, however, Captain Mungavin stated that he was "well acquainted with this line of road for many years," and that he could "feel no hesitation in stating that there is ample waterway," and as the Chief Engineer, in his letter No. 11369, dated 6th November 1855, recommended, in reliance on the confidence expressed by Captain Mungavin as to the sufficiency of waterway provided by him, that the execution of the Drains, as designed, should be sanctioned; Government, in their Resolution No. 1719, dated 15th November 1855, acceded to this recommendation, with the following remark:—

> "Lieutenant Mungavin should be furnished with a copy of the "Superintending Engineer's letter No. 5243, of 23rd October, and "informed that it is only because he has so confidently asserted the "sufficiency of the waterway of the proposed Drains, in consequence "of his being well acquainted with the line of road for which they "are designed, that Government have consented to sanction them "without further question."

That Captain Mungavin, without setting at rest the doubts stated by the Superintending Engineer, and thus urged on his notice by Government, persisted in carrying out the designs, which have been proved to have been altogether unsuitable, is most discreditable to him.

53. With respect to the Waghoonda Bridge,† the failure of which appears, from the Chief Engineer's letter No. 3855, dated 22nd July 1857, to have been due to its being built on an inappropriate site, with unsound foundations, and without sufficient waterway,‡ the circumstances under which its construction, according to the design

* Page 193. † Page 193. ‡ Page 204.

submitted to Government, was sanctioned, are shortly stated, as follows, by the Chief Engineer, in para. 3 of his letter last quoted: —

"The estimate for the Bridge at Waghoonda, amounting to "Rupees 7,072 was, with the design, forwarded to me by Colonel "Scott, on the 16th November 1855, and laid before Government "with my letter No. 12131, of the 29th idem. The design was not "objected to by Colonel Scott, nor indeed did he offer any opinion "concerning it; but he referred to a former letter, with which he "had transmitted estimates for Drains prepared by the same Offi- "cer, Lieutenant Mungavin, in which he had expressed doubts as to "the sufficiency of the waterway. That former letter, with a letter "from Lieutenant Mungavin affirming his certainty that the water- "way provided was sufficient, accompanied my letter No. 11369, "of the 6th November 1855. Besides making this reference to his "letter about the Drains, Colonel Scott stated that he had pro- "posed to send in another design and estimate, but that he had "not been able to prepare it in a satisfactory way. To this pro- "posal I alluded in my letter, submitting the plan and estimate for "the sanction of your Lordship in Council, stating that I did not "approve of the practice adopted by Colonel Scott of superseding "the plans of the local Executive Engineers by plans prepared un- "der his own eye. At the same time I stated that I saw no objec- "tion to the design by Lieutenant Mungavin, which was remark- "ably cheap. The waterway, according to Lieutenant Mungavin's "section, which it now appears was inaccurate, seemed sufficient, "and the design was light, simple, and well adapted to its position. "The sanction of your Lordship in Council was, on my recommend- "ation, accorded to the estimate, by the Government Resolution "under Mr. Secretary Hart's Memo. No. 1807, of the 8th Decem- "ber 1855."

On the failure of the Bridge being brought to the notice of Government, they passed the following Resolution, No. 2442, dated 27th August 1857:—

"Captain Mungavin, who surveyed the site and designed the "Bridge, is now in Europe on furlough. On his return to India,

" he should be called upon to submit any explanation he may have to " offer with reference to the disaster now brought to notice. In the " mean time, Lieutenant Cotgrave, who superintended the construc- " tion of the work, should be requested to explain how he failed to " discover that the site selected by Captain Mungavin was defective."

Lieutenant Cotgrave's explanation, dated 23rd September 1857, was submitted to Government with the Chief Engineer's letter No. 5388, dated 14th October 1857, in which he stated his opinion that—

" Lieutenant Cotgrave's explanation seems to exculpate him from " any charge of negligence, with the exception, however, that he " does not appear to have instituted inquiries as to the level of the " highest floods; a neglect the more remarkable, as he had found " Captain Mungavin's section of the river so much in error."

In this opinion Government, on the 6th November 1857, recorded their concurrence with Major General Waddington.

54. Captain Mungavin will not be re-employed in the Department of Public Works.

55. The circumstances connected with the metalling of the Poona and Ahmednuggur Road* are, in their way, as unsatisfactory as those just noticed. A Supplementary Estimate of no less sum than Rs. 58,435 has been submitted to Government as still required to complete this work, the whole of which was, as stated in the 25th paragraph of Captain Scott's Report,† at first estimated to cost no more than Rs. 42,864. Captain Scott attributes the mismanagement observable in this matter to " want of proper superintendence;" and Major General Waddington, at the close of his 8th paragraph,‡ applies this censure to the Assistant Overseer employed on the work: but Government cannot help perceiving that it would have been impossible for the inefficiency of a subordinate to have occasioned the discreditable waste of money which has occurred on this road, had the Executive Engineer been but moderately efficient in his duties of general supervision and control. The Governor in Council believes that this censure must be extended to both Lieutenant Cotgrave and Captain Mungavin.

* Pages 194 to 204. † Page 194. ‡ Page 205.

56. Among the miscellaneous projects noticed in Captain Scott's 32nd and following paragraphs, is one described in para. 36,* for a portion of the Ahmednuggur and Malligaum Road. This was commenced by order of Government, in anticipation of the sanction of the Government of India, as a means of employing Ryots who were suffering from famine; and the Collector of Ahmednuggur, at whose instance this was done, wrote in such high terms of the manner in which the work was forwarded by Lieutenant Sprot, that Government, by a Resolution, No. 2453, dated 14th October 1856, ordered that the construction of as much of this road as could be undertaken by Lieutenant Sprot should be entrusted to him. Government regret that the late orders of the Government of India will not justify any further present progress in the work on the Ahmednuggur and Malligaum Road (the importance of which is dwelt upon by the Chief Engineer in paras. 5 and 6† of his letter) than to sanction the addition of a coat of moorum to make available the embankment prepared by Lieutenant Sprot.

57. The scheme of Establishments submitted by this Government for the sanction of the Government of India, will, Government hope, remove the difficulty‡ of providing scientific agency competent to design such Irrigational Works as may be found feasible in the Ahmednuggur District.

58. With respect to the subject of the Chief Engineer's 12th paragraph,§ Government agree with him in his remarks on the mode of laying out even ordinary cleared roads, so as to be susceptible of being improved without losing the work expended on them. The Governor in Council observes that a Notification, as follows, was issued on this subject nearly three years ago:—

"NOTIFICATION.

"The Right Honorable the Governor in Council having had "occasion to observe, that notwithstanding the previous orders of "Government to the contrary, ordinary clearances of cart tracks,

* Page 196.
† Page 205.
‡ Pages 200 and 206.
§ Pages 206 and 202.

" sanctioned by Government, are sometimes made without choosing " the best possible line of road between the points which it is " intended to connect by such cleared roads, is pleased to direct that " for the future this improvident and mischievous course be most " carefully avoided ; and that in every case, where any clearance " of a cart road is sanctioned, it shall be executed by following " the line best adapted for a permanent made-road, which line " must, in every case, be in the first place determined by a com- " petent Surveyor."

59. As Captain Scott has not been able, for the reasons noticed in Major General Waddington's 8th paragraph,* to describe the qualifications and conduct of the Officers of his Department, Government have nothing to record on this subject regarding any of the Officers not already named; excepting that, in correspondence lately before them, Mr. Victor's qualifications and efficiency are commended.

CANDEISH.

(Pages 210 to 233.)

60. With respect to Captain Bell's Report, Government have little or nothing to add to the remarks recorded in Major General Waddington's Report No. 4083, dated 3rd August 1857.† Captain Bell's proceedings have been as satisfactory as was possible under the circumstances with which he has had to contend.

61. The Governor in Council is gratified by observing that Captain Bell writes of Lieutenant Maunsell‡ as a useful Assistant. Captains Lockhart, Piers, and Beale§ have left the Department of Public Works to rejoin their Regiments.

62. His Lordship in Council also observes that Captain Bell has had reason to be satisfied with the services of the Subordinates mentioned in paras. 25 to 27‖ of his Report, and in para. 9 of the Chief Engineer's letter.¶ The promotion of Maistree Bapoo Gunput to be a Sub-Overseer of the 1st Class, on a salary of Rupees 40 per mensem,

* Page 205. † Page 230. ‡ Page 226.
§ Pages 225 and 226. ‖ Pages 227 and 228. ¶ Page 232.

as recommended in the 10th paragraph of the latter,* was ordered by Government Resolution No. 3021, dated 20th October 1857.

SURAT AND BROACH.

(Pages 236 to 253.)

63. Lieutenant Trevor's operations in the Surat and Broach Collectorates, and the Gogo Division of the Collectorate of Ahmedabad, are clearly described in his Report.

64. This Officer deserves the commendation recorded in the Chief Engineer's letter No. 3930, dated 25th July 1857,† and the Governor in Council regrets that the increasing requirements of the Railway Department, in which Lieutenant Trevor is a Deputy Superintending Engineer, have rendered it necessary to relieve him of his temporary appointment as Acting Executive Engineer of Surat and Broach, in which he has shown much zeal and energy.

65. But few remarks on the subjects of Lieutenant Trevor's Report appear necessary in addition to those contained in the Chief Engineer's letter.

66. The result of the former correspondence, referred to at the close of Lieutenant Trevor's 1st paragraph,‡ having been that Government were convinced of the superiority of the Balda route, over that by Dhurumpoor, for a road between Bulsar and Peint, on the Bulsar and Nassik Line, it has been resolved to enter the road, as recommended by Lieutenant Trevor, in the Review Statement, preparatory to the Budget of 1858-59; and measures have been taken for entering into negotiations with the Dhurumpoor Raja, with a view to purchase from him the right of levying transit duties on roads constructed by Government through his territories by this or any other route; for it is hoped that it may also, ere long, be found practicable to construct a road from Bulsar through Dhurumpoor to Candeish, by a line surveyed about two years ago by Mr. Henry West, Civil Engineer.

67. With respect to the subject of the 3rd paragraph of Major

* Page 233. † Page 250. ‡ Page 236.

General Waddington's letter,* and those parts of Lieutenant Trevor's Report to which it refers,† it is only necessary to remark that, as the whole expense of the road under construction between Gogo and Ahmedabad is estimated at more than twelve lakhs of Rupees (£120,000) by the lowest calculation, and (if one of the estimates for metalling be accepted as correct) may amount to more than eighteen and a half lakhs (£185,000), the delay ordered in constructing Bridges on the portion of this road which extends from Vertej northward to Ahmedabad, pending inquiry as to the best line for a Railway, was a matter of necessity. There has been no check (except that common to all Public Works at the present juncture) placed on the construction of the road between Gogo and Vertej, which is not affected by this inquiry, the requisite measures for carrying out which, by the appointment of a staff of Surveyors, have lately been taken by Government.

68. The appointment of the Guzerat Ports Committee, of which Lieutenant Trevor was President, has, Government consider, been attended with favorable results. With respect to the 14th and other paragraphs‡ of Lieutenant Trevor's Report, which relate to the projects more especially under the consideration of the Committee, and his general remarks on the importance of the subject, it may be as well to note, that in the scheme submitted last year to the Government of India for the reorganization of the Public Works Department of this Presidency, according to the scales of the Fort William Notification of 17th June 1856, provision is made for the appointment of an Executive Engineer with two Assistants for the charge of Gogo and the Guzerat Ports.

69. The reclamation of the Oojul Bann, referred to in paras. 23 and 24 of Lieutenant Trevor's Report,§ and para. 8 of the Chief Engineer's letter,‖ has been conditionally approved of by Government; and a detailed project for carrying it out will, it is hoped, be entered in the Review Statement, preparatory to the Budget of 1858-59.

70. With respect to the Irrigational projects referred to in

* Page 250. † Pages 238 and 249. ‡ Pages 240 to 242.
§ Page 242. ‖ Page 252.

Lieutenant Trevor's 25th paragraph,* one of the most important of these was brought before Government with his Report of the 26th February, which shows the probability that an Irrigational Canal from the Taptee would be feasible and remunerative. This Report is still under the consideration of Government, and, with respect to the general subject of Irrigation in Guzerat, it may be sufficient, for the present, to note, that the Government of India have sanctioned the appointment of an Officer to organize a Survey, which will determine the most advantageous mode of proceeding, to obtain the advantages of Irrigation in this improvable District.

AHMEDABAD AND KAIRA.

(Pages 256 to 267 and 271 to 274.)

71. The operations of Captain Scott's Department, so far as they have depended on himself, are considered by Government to be satisfactory. He seems to have had good reason for his repeated complaints of a want of scientific and subordinate Assistants to be permanently attached to his Office.

72. The Sketch attached to Captain Scott's Report, which Government observe was prepared by Lieutenant Cotgrave, is carelessly drawn, and practically useless as an illustration of the Report.

DEESA.

(Pages 275 to 291.)

73. Captain Curtis, though his Charge, except in respect of Military works, is not of an extensive or important nature, and his expenditure has not been great, has submitted an interesting Report. His attempts to reform such abuses as that noticed in his 4th paragraph† are praiseworthy, and will, Government hope, have a good effect in correcting the mode of work and laxity of supervision which had, before Captain Curtis's appointment to the Deesa Charge, been noticed in it, and which had, indeed, led to the removal of two Exetive Engineers consecutively, and necessitated the severe measures

* Page 253. † Page 275.

adopted by Government, to which allusion is made in Captain Curtis's 38th paragraph.*

74. Government consider that the measures proposed in Captain Curtis's 30th paragraph,† for securing the proper repairs of the Mount Aboo Ghaut, are reasonable, and ought to have a fair trial.

75. The experiment of paying workmen every day,‡ Government think, with Major General Waddington,§ one that is likely to prove troublesome, and to open a door to fraud where the payments cannot be superintended by the Executive Engineer, or some perfectly trustworthy subordinate.

76. With respect to the general observations contained in the 8th and two following paragraphs of the Chief Engineer's letter‖ No. 4801, dated 7th September 1857, Government need only remark that the style of accommodation now sanctioned for European Soldiers, has been strongly urged by Officers who have had daily opportunities of observing the requirements of such Soldiers and their families, and has been adopted with the approval of the Government of India and the Honorable Court of Directors.

77. Having thus noticed at greater or less length the Reports of the Executive Engineers submitted by the Chief Engineer of Public Works, the Governor in Council has to observe that he has not obtained from the Superintending Engineers of the Southern, Central, and Northern Provinces, such notices of those Reports, as he had hoped for.

78. With the exception of some of his remarks¶ on the Sattara Report, there is little or nothing of any value submitted by Lieutenant Colonel Kilner.

79. Colonel Scott's removal to Sind, and the recency of Major Tremenheere's appointment to act for him in the Central Province, have prevented either of them from being able to fulfil the wishes of Government as regards the Reports of the Executive Engineers of that Province.

* Page 285. † Page 282. ‡ Page 275.
§ Page 287. ‖ Pages 288 to 290. ¶ Pages 81 to 83.

80. Colonel Goodfellow has not stated his opinion of the Reports of the Officers subordinate to him, though he has offered some general observations of his own* on the requirements of Guzerat.

81. With respect to these observations, which are contained in Colonel Goodfellow's letter No. 1007, dated 28th July 1857, and have been submitted to Government by the Chief Engineer of Public Works with his letter No. 4659, dated 31st August following,† as an annexment to the Report by the Executive Engineer of Ahmedabad and Kaira, it has been remarked above that the Government of India have sanctioned the employment of an Officer as Superintendent of an Irrigational Survey of Guzerat, though, under present circumstances, this sanction cannot be availed of. The improvement of the Ports of Guzerat has been considered to some extent by the Guzerat Ports Committee, from whom Government have obtained much valuable information; and the scheme of Establishment submitted for the sanction of the Government of India will provide a separate Executive Engineer for the improvement of Gogo and the Guzerat Ports. The statement made in Colonel Goodfellow's 5th paragraph,‡ that the country roads, on which experiments have been tried towards carrying out Colonel Kennedy's scheme of improvement, are worse in consequence of it, is not borne out by the evidence regarding the partial success of this experiment obtained some time ago by Government. The state of the Tanks§ has been a source of anxious consideration, and many endeavours have lately been made by Government to obtain a class of Overseers to whom their charge may be confided. As an experiment, with this object in view, the youths partially instructed in Colonel Goodfellow's Office, and referred to at the close of his 6th paragraph,‖ have now been attached, for practical instruction, to the Offices of Executive Engineers. With respect to the observations contained in Colonel Goodfellow's 6th paragraph,¶ in which Government fully agree with him, it is hoped that the scheme of Establishments lately submitted for the sanction of the Government of India, will, when carried into

* Pages 268 to 270. † Page 271. ‡ Para. 269.
§ Page 269. ‖ Page 270. ¶ Page 270.

effect, supply all the agency requisite in Guzerat, both as regards Engineers and Subordinates.

82. In closing this Minute, Government desire to record their high appreciation of the care and attention with which Major General Waddington has met their wishes in the manner in which he has submitted these Reports. He has spared no trouble, and, though Government have not been able to concur with him in *all* his remarks, they recognize their value generally, and are much indebted to him for the independence, as well as the scrupulous care, with which he has fulfilled their instructions.

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